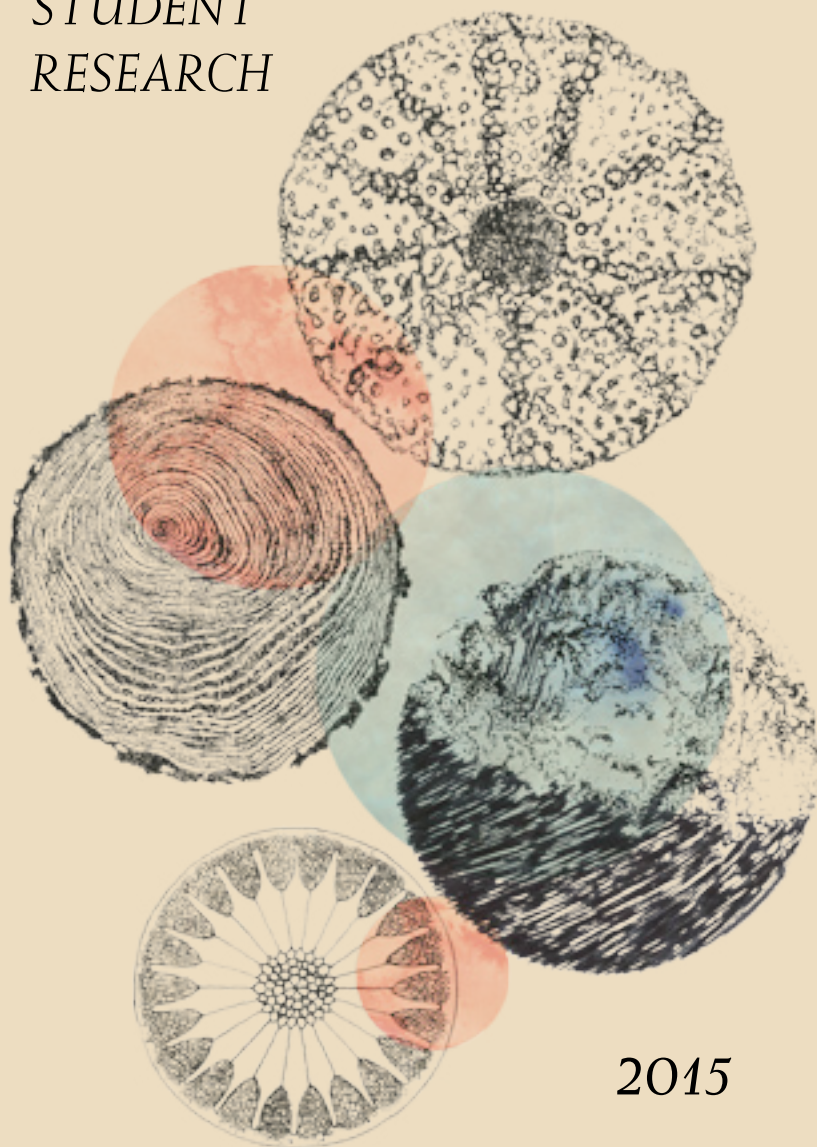


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Foreword

Viewing the drafts of cover art for this issue brought to mind lines from a popular children's hymn: "All creatures bright and beautiful / All creatures great and small." As we prepared to bring Volume XIV of the *UW-Stout Journal of Student Research* to press, I was struck by the range of subjects and topics that are worthy of study. The orbs on our cover suggest rugged subjects of an astronomic nature, and the delicate symmetry of an aster blossom.

In this volume of the JSR, we offer up a sampling of the inquisitive, intuitive, credible, and meaningful research taking place across our campus; it is gratifying to see the range of fields represented. Strangely, over the life of this journal, this range hasn't occurred with a pancake-level uniformity from across the board, but rather has come in groups and clusters, peaks and valleys, that shift from year to year to create a less uniform, but no less interesting landscape of knowledge to survey. This year, for instance, we find three different investigations of the same ephemeral pond ecology (ephemeral—now who would have thought to research something 'ephemeral?'), while a surprising number of submissions address small parts of practical economic questions. It makes one wonder what is in store for Volume XV!

Readers will find a number of articles of relevance to a university community, asking questions of underage drinking, foreign student experience, and how students manage debt; in at least one case, the curiosity prompting a study had its seeds in a study abroad experience, and there is one study that puts the *JSR* itself under the microscope!

In last year's volume we began to note, where we were aware, of research that was supported by programs originating on or off campus: Research Services, Honors College, the McNair Scholars. We do so again this year, joining the authors in gratitude for the support those programs have provided. I must also express my gratitude to the individuals and groups on the UW-Stout campus that have assisted in making the JSR a success. Many are listed on the following pages: faculty advisors who mentor the student authors through the process, faculty reviewers who serve as peer reviewers of the content (and who often go to great lengths to help the authors maintain rigorous standards of research and theory), the Research Services staff, including Kaitlyn Suda's early-stage help, the Cross-Media Graphics Management teams, and new this year, invaluable editing and proofreading help from Dr. Kate Edenborg's Editing Processes and Practices class. We hope you will be as pleased to read this volume as we are excited to present it.

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Determinants of Violent Crime in the U.S: Evidence from State Level Data

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Sophomore, Applied Social Science: Concentration Economics

ABSTRACT

This study examines the determinants of violent crime in the United States. It argues that violent crime is affected by socio-economic and public policy factors. To test the hypothesis, the study uses recent state level data on violent crime from FBI uniform crime reports. Fixed effect regression was used to analyze the data. The results indicated that there is a positive relationship between income inequality and crime. An increase in the level of inequality by one unit will result in an increase in violent crime by 330. We also found that control variables, such as state and local government expenditures on policing and public safety, and community development reduce violent crime. Other factors, such as education and population density are not statistically significant, showing they do not directly affect crime. These results help us better understand the determinants of violent crime and what must be done to reduce criminality in our society. First, there have to be policy measures to diminish the trend towards increased income inequality in order to reduce delinquency. Second, states have to continue dedicating adequate resources towards policing and public safety, and increase community development, in order to reduce crime.

INTRODUCTION

Crime is the number one public problem. According to recent data published by the Federal Bureau of Investigation (2013), violent crime levels rose for the first time in six years during 2012, with an increase of 1.5 percent in the Midwest. Between 2011 and 2012, the violent-crime rate rose 15 percent and the property-crime rate rose 12 percent, based on data from the annual National Crime Victimization Survey. The FBI (2010) reported that in 2010 a violent crime occurred every 25.3 seconds in the United States.

Violent crime greatly affects the United States economy. A recent study (Shapiro & Hassett, 2012) found that violence affects tax payers, property owners, and individuals through increased spending on corrections, policing, lost wages, medical expenses and more. It also indicated that violent crimes inflict other, less intangible costs, including the pain

and suffering of victims, a reduced quality of life for everyone, and lower investment levels and property values.

Knowing how violence influences society and the economy, it would be beneficial for the United States to have the ability to lower violent crime. However, previous studies have produced different results regarding the determinants of violent crime. Moreover, most studies used a traditional multiple regression without controlling for state-level specific factors that affect the level of violent crimes. The objective of this paper is to provide a systematic investigation of the determinants of violent crime, with the intention of shedding some light on public policy issues surrounding reducing violent crimes across states. To be more specific, this paper asks the following questions: What variables influence the level of violent crime? What can be done to lower it? In this paper it's argued that violent crime is affected by socio-economic and public policy factors. More specifically, it looks at the relationship between the level of violent crime and income inequality, per capita income, population density, unemployment compensation, home and community development expenditures, police and correction expenditures, and library expenditures. This paper used a fixed effect model to capture the effects of variables, both observable and unobservable that differs across states, but are constant over time. By determining the causes of violent acts, the government will be able to put into place more effective policies that allocate resources for the reductions of crime in a more efficient manner. Effective policies and resource distribution would likely allow the government and the residents of United States to save a great deal of money and increase the quality of life in general.

Theory and Evidence

In the literature on the economics of crime, the economist look at criminals as rational individuals who seek to maximize their individual well-being through illegal instead of legal means. The economic approach toward crime is based on the assumption that the decision to commit a crime, like any other economic decision, can be analyzed as a choice among alternative combinations of costs and benefits. One important application of an economic analysis is that it can be used to predict the effectiveness of law enforcement measures.

Economists all around the world are curious as to what influences violent crime. One plausible policy for reducing crime would seem to be increasing the police force. By using the concept of elasticity, one particular study (Levitt, 2004) found that by increasing police, the crime rate

during the 1990s fell somewhere around 5 percent.

Although, some studies suggest that more police does deter crime, there is still other evidence (Dills & Summers, 2010) that having more police may not always deter crime because violent offense levels were unstable, even though more police were being hired. Prison may have increased crime by turning some criminals into dangerous criminals due to the fact that felons surrounded them all day. Additional variables mentioned in the crime literatures include conceal and carry laws, capital punishment, and the legalization of abortion.

Some previous studies (Cho, 1973) have looked at whether public policies actually had an effect on the levels of violent crime. The overall results indicated that there is a positive correlation between correctional policies and crime deterrence. It is also indicated that other factors, such as racial and ethnic composition, education, income, and density of house populations, are significantly correlated with crime rates. Regarding the economic benefits of reducing crime, in 2010 violent crimes cost Americans somewhere around \$42 billion, which was used for policing, courts, medical bills, lost wages, and more. Many Americans hold their wealth in the value of their homes, when violence causes a reduction in the value of homes many Americans are affected by it. For instance, a reduction in a given year of one homicide in a zip code causes a 1.5 percent increase in housing values in that same zip code the following year (Shapiro & Hassett, 2012).

In cities like Baltimore and Detroit the violent crime levels are not dropping as fast as other major cities because of economic and racial segregation. When a city is more integrated crime is less likely to happen.

DATA AND METHODOLOGY

The crime data is primarily from the FBI uniform crime reports web site (2013). Policy variables are collected from the state policy index web site (2010). The income inequality data is primarily from the state level time series data prepared for Russell Sage program on the social dimensions of inequality (Guetzkow, 2007).

Figure 1 below shows the descriptive statistics of variables used in our regression. Income inequality uses the Gini index. The Gini index, also known as the Gini coefficient, examines a nations income distribution, which can determine the nations income inequality. The Gini index ranges from 0 to 1 with 0 being perfect equality and 1 being perfect inequality. The police expenditure measures the amount of money (in millions) that state and local governments spend on police, firefighters,

and regulatory services. The correction expenditure measures the dollar amount (in millions) that state and local governments spend on corrections, including prisoning and jailing. Unemployment compensation measures the amount (in millions) that state and local governments spend on unemployment benefits. Housing and community development measures the amount of dollars (in millions) that state and local governments spend on developing the communities and housing. Library expenditure measures the amount of dollars (in millions) that state and local governments spend on libraries. Finally, population density measures the population per square mile.

FIGURE 1. DESCRIPTIVE STATISTICS

Variables	Mean	Std. Dev.
Violent Crime (per 100,000 people)	473.1041	245.6827
Inequality (GINI)	.370238	0.026416
Police Expenditure (in millions of dollar)	985.5356	1566.614
Correction Expenditure (million)	544.3934	931.4684
Education Expenditure (million)	6445.936	8386.569
Unemployment Compensation (million)	66.94131	74.89209
Housing and Community Development (million)	346.4688	642.9284
Library Expenditure (million)	90.62048	126.0906
Total Expenditure (million)	22084.14	31392.45
Population Density	169.1227	235.4244
Per Capita Income	19533.33	7084.873

In order to estimate the equation below, we used fixed effect regression to account for all unobserved factors that vary across states but are constant over time. For the baseline model, the results for the random effect model and the model that take cross-sectional dependence into consideration (Driscoll & Kraay, 1998) are also provided.

$$\text{InViolent} = \beta_0 + \beta_1 \text{GINI} + [\beta_2 \text{Police} + \beta_3 \text{PopDen} + \beta_4 \text{Com.Dev} + \beta_5 \text{Unempl.Comp} + \beta_6 \text{Lib} + \beta_7 \text{Income} + \beta_8 \text{Corr.}] + \varepsilon_t$$

RESULTS AND DISCUSSION

Figure 2 below shows the relationship between violent crime and income inequality between 1965 and 2004. There is a visible positive relation between the two variables. The Central Intelligence Agency (CIA) Fact Book recorded that in 2007 the Gini index of the United States was around 0.45, which is high. The United States has one of the most income-unequal nations and has the largest percentage of its population in prison among developed democratic nations. Efforts at reducing the income gap will provide some solutions to the crime problem, both within the poor neighborhoods as well as to crimes targeted at richer residents.

FIGURE 2

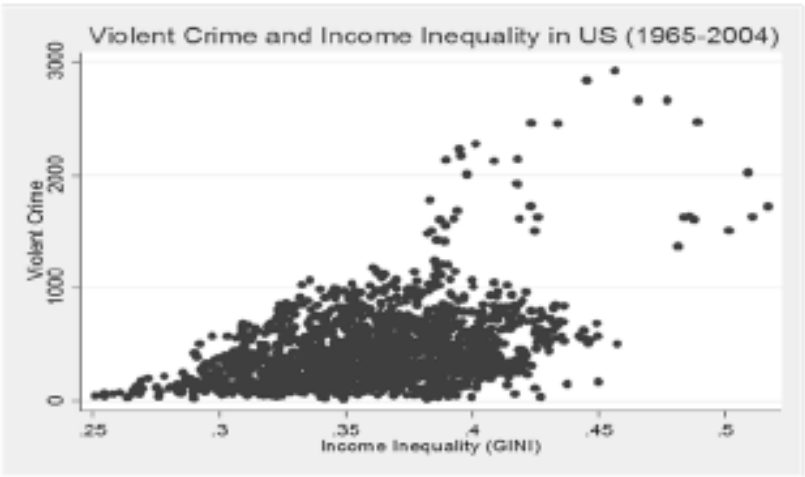


Figure 2. Violent crime and income inequality (1965-2004)

This next figure (figure 3) below represents the changes in the Gini index throughout the United States over a period of around fifty years. It can be seen that in the mid 1970s to early 1980s there was an overall decrease in income inequality. This decrease in income inequality may explain why during the mid 1980s there was a decrease in violent crime. It can also be seen that in the 1990s income inequality began to rise, which may explain the increase in violence in the early to mid-2000s.

FIGURE 3

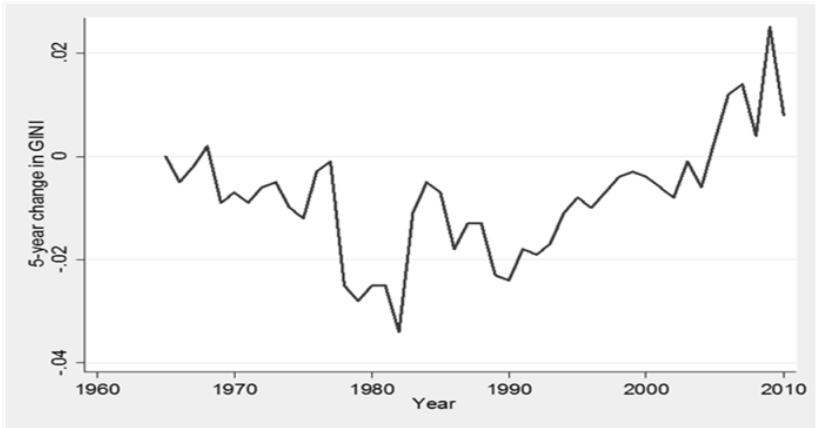


Figure 3. Five-year changes in income inequality in U.S (1960-2010)

Figure 4 below shows the Gini index for each U.S. state throughout the past 45 years or so. Overall, the graph shows an increase in income inequality throughout the recent decades. Between 1979 and 2007, the top 1 percent took home well over half (53.9 percent) of the total increase in U.S. income. Over this period, the average income of the bottom 99 percent of U.S. taxpayers grew by 18.9 percent. Simultaneously, the average income of the top 1 percent grew over 10 times as much—by 200.5 percent (Sommeiller & Price, 2014).

FIGURE 4. Income inequalities in U.S by State

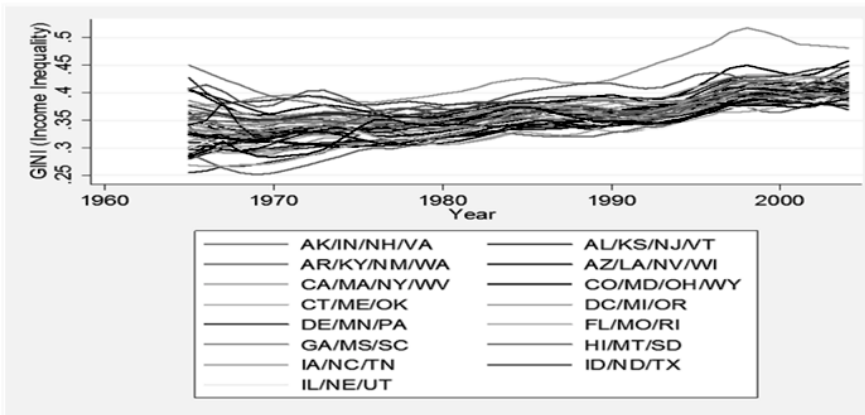


Figure 5 below presents the baseline model that shows the relationship between violent crime and income inequality. The results provide a fixed effect, a random effect and a fixed effect model that control for cross-sectional independence. It can be seen that the Gini index, the variable of interest, which represents income distribution, is statistically significant. The existence of a very strong positive relationship between the two variables means that as income inequality increases so will levels of violent crime. By taking the exponential value Gini coefficient (5.80) one is able to determine that when income inequality increases by one unit, violent crime will increase by 330 units per 100,000 people. The result is consistent with previous study (Hsieh & Pugh, 1993) the meta-analysis study that found violent crime to be strongly associated with both income inequality and poverty.

FIGURE 5. Violent crime and income inequality in U.S (1965-2004)

VARIABLES	(1) Fixed Effect Model	(2) Random Effect GLS	(3) Fixed Effect (DK Std. err.)
GINI	5.80*** (0.288)	5.83*** (0.261)	5.80* (2.207)
Constant	3.74*** (0.105)	3.73*** (0.123)	3.74*** (0.839)
N	2,040	2,040	2,040
R ²	0.19	0.20	0.20
Adj. R ²		0.20	0.20
Number of groups		51	51

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Figure 6, below presents the complete model of the fixed effect regression. The independent variables include both the socio-economic and public policy factors. It can be seen again that income inequality is statistically significant and has a positive relationship to violent crime. Police expenditure is also statistically significant; however, it is negatively related to violent crime. This means that as police expenditures increase, violent crime levels will be expected to decrease. The result has an important implication that increasing the number of police may curb the likelihood of individuals committing acts of violence. Housing and community development was likewise statistically significant and negatively related. Unemployment compensation was somewhat statistically significant and positively related to violence levels. A good community program such as after school youth programs or community extracurricular programs may limit the suitability of location for crime and increase public safety. Moreover, it may increase educational and recreational

opportunities for young adults, and may increase the capacity of local people to deal with social problems in their area. Library expenditures were negatively related to violence levels. Opening a library for local community may play a role for creating an educational opportunity for young adults and create good citizens.

Population density is weakly statistically significant, however, it was negatively related, which is opposite to what one would have expected. This finding suggest, that as population increases per square mile, violence is less likely to occur due to there being more witnesses around and the idea that the crime is more likely to be reported.

Correction expenditure was statistically significant and positively related to violence. For many states the opportunity cost of the resources used for corrections is becoming too high since it results in less money available for other priorities like education or infrastructure. There is evidence that increased incarceration rates have some effect on reducing crime, but crime rates are shaped by many other factors discussed above.

FIGURE 6. Determinants of violent crime in U.S

VARIABLES	(1) Fixed Effect Model
Income Inequality	1.2815*** (0.2964)
Police Expenditure	-0.0130*** (0.003)
Housing & Com. Dev.	-0.0001*** (0.0000)
unemployment Comp.	0.0398* (0.0144)
Library Exp.	-0.0101 (0.01353)
Population Density	-0.0014* (0.0005)
Correction Exp.	0.0159** (0.0031)
Per capita Income	3.34e-06 (0.000)
Constant	5.59*** (0.158)
Observations	1,150
R-squared	0.91
Adj. R-squared	0.91

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

CONCLUSION

The rate of violent crime in the United States is constantly changing in what seems to be unpredictable ways. Without knowing what variables influence the level of violent crime, many resources are going to waste and policies designed to combat crime become less effective. These research findings indicate that violent crime is mostly influenced by income inequality. When income inequality increases by one unit it will result in an increase of violent crime by 330 units. Additional variables that affected violent crime include: state and local government expenditure on policing and public safety, housing and community development, and population density. Knowing what variables influence violent crime will allow for more effective policies to be put into place and also allow for resources to be allocated more efficiently. A reduction in violent crime would increase the value of homes in many parts of The United States and may lead to a decrease in taxes for policing and corrections. According to a prior research (Shapiro & Hassett, 2012) a 10% reduction in violent crime would save Americans around \$20 billion a year. If the United States hopes to lower violence levels a focus needs to be placed on how to lower income inequality levels.

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College Stress and Strategies to Reduce it

Alyssa Stinson

Junior, Supply Chain Management & Business Administration

ABSTRACT

The college years can be a stressful time, contributing to the manifestation of physical and emotional concerns among students. While stress cannot be completely avoided, using the proper stress management techniques will help reduce it. Through meta-analysis, this paper summarizes the main types of stress college students experience, as well as what can be done both individually and as a society to reduce this stress. By learning to manage stress, students will be able to persevere through college and prepare for a healthy future.

Keywords: stress, management, wellbeing, decrease, reduce

INTRODUCTION

One's college years are often said to be the best years of an individual's life, but is that truly the case? Stress, a term coined by Hans Selye 50 years ago, seems to be at the forefront of many students' minds (Rosch, 2013). Selye was the first to study the feelings of stress; some may consider him the father of stress. Various stressors are constantly affecting students' daily lives, and being stress-free is unheard of. Stress is inevitable. Fortunately, by learning how to cope with stress properly, individuals can reduce the effects.

Souce of Stress

"Stress" is an all-encompassing word used to describe anything that might be affecting one's wellbeing or mental health. Stress is prevalent in our society. According to Pearlin, Menaghan, Lieberman, and Mullan, "The sources of social stress can be traced to the very boundaries of societies, their structures and cultures" (1981, p. 338). In the United States, the constant drive to work harder, be better, and achieve more is likely part of the reason individuals are feeling stressed. While socioenvironmental conditions differ in the capacity to evoke stress, some conditions threaten virtually everyone, regardless of the society they live in.

On an individual basis, stress stems from both the occurrence of discrete events and the presence of relatively continuous problems. While individuals are almost always trying to protect and improve themselves, they often experience a lack of success as they fail to meet a specific goal in their

life. Mastery, the feeling of being in control of forces that affect one's life, and self-esteem are linked to stress. When mastery and self-esteem decrease, stress increases (Pearlin, Menaghan, Lieberman, & Mullan, 1981). Rather than damaged self-concepts being indicative of stress, they actually show to be sources of it.

The main stressor that research emphasizes is a life-changing event. These changes may leave individuals feeling defeated due to the amount of worry, strain, or tension placed on them. Of course, leaving home and going off to college is a life-changing event. Other examples include divorce or new marriage, a close friend or relative passing away, or a lay-off from work. Even in college, students may be faced with these particular stressors, along with a variety of others. It has been concluded that "life events may create new strains or intensify preexisting strains, and it is these new or intensified strains, in turn, that eventuate in stress" (Pearlin, Menaghan, Lieberman, & Mullan, 1981, p. 339). Though life-changing events cause significant impact, any change can be stress provoking. It is not surprising that "undesirable events are most psychologically distressing, and other dimensions such as whether events can be controlled or predicted are of secondary importance" (Ross & Mirowsky, 1979; Thoits, 1983). Stress surfaces because the organism is fundamentally intolerant of change. During the college years, many changes take place. The initial transition from high school to college can be especially anxiety provoking; so can studying for big exams, meeting new people, and taking on new responsibilities.

It is known that college students suffer from stress, but what level of stress do students typically have? As Makrides, Veinot, and Richard (1998) discovered in their study on cardiovascular health among college students, nearly 60% of participants reported high or very high stress. Though the amount of stress that individuals consider "high" may differ, this reflects that a significant percentage of college students are impacted by feelings of stress. All this stress during the college years tends to arise from a few specific sources, as compared to general stress. According to Misra and McKean (2000), the sources of stress that students face can be categorized into five groups: academics, financial, time-related, health-related, and self-imposed (p. 41).

Academics

A student's perception of the extensive knowledge base required and the perception of inadequate time to develop it leads to academic stress. Academic stress usually occurs at predictable times each semester, such as studying for exams because of the large amount of content to master in a small amount of time (Misra & McKean, 2000, p. 41).
frustration" (Misra & McKean, 2000, p. 44).

Effects on Wellbeing

It is important that students understand how to manage their stress, as it has an effect on their overall wellbeing. In a study of 24,234 university students, results showed that although depression can occur, college is predominantly an anxiety-provoking time (Bewick, Koutsopoulou, Miles, Slaa, & Barkham, 2010, p. 643). The psychological wellbeing of undergraduate students decreased over the course of their study; this shows the importance of using proper strategies to stay healthy. In addition to stress, other factors shown to affect wellbeing are finances, socioeconomic status, life goals, and social support. When a student's wellbeing decreases, it is likely that his/her self-esteem will decrease as well. This can cause more stress and repeat the vicious cycle. By maintaining a healthy wellbeing, students are more likely to manage their stress, which will help them succeed. As Thoits (2006) states, "Individuals who are in good mental health presumably are better able to set goals, initiate and persevere in desired lines of action, and engage in problem-solving efforts intended to alter their stressful circumstances for the better" (p. 312). These tools will likely help them improve their college performance overall.

Gender Differences

Gender brings an interesting dynamic to college stress. It is difficult to make general conclusions about stress among college students because males and females tend to have different habits and patterns. Overall, females typically have higher stress levels than males. Li and Lindsey (2008) determined 52 health-promoting behaviors or ways of thinking and used them to determine the differences between male and female habits. Of 52 behaviors, 10 of the items have at least a 10% difference between males and females. These behaviors are:

1. Take part in recreational physical activity, such as swimming, dancing, and bicycling
F= 23.7% M= 37.8%
2. Choose a diet low in fat, saturated fat, and cholesterol
F= 13.1% M= 25.2%
3. Discuss my problems and concerns with people close to me
F= 34.1% M= 22.1%
4. Maintain meaningful and fulfilling relationships with others
F= 58.7% M= 43.3%
5. Find it easy to show concern, love, and warmth to others
F= 48.4% M= 32.5%

- | | | | |
|-----|---|----------|----------|
| 6. | Find ways to meet my needs for intimacy | F= 19.5% | M= 31.1% |
| 7. | Get support from a network of caring people | F= 44.0% | M= 23.0% |
| 8. | Take some time for relaxation each day | F= 38.0% | M= 57.0% |
| 9. | Use specific methods to control my stress | F= 8.0% | M= 19.7% |
| 10. | Balance time between work and play | F= 19.5% | M= 30.3% |

These 10 behaviors alone reinforce the fact that females are drawn toward other people easier than males are. Of course, this statement is not representative of the entire female population, but it is more typical for females to put others first, leaving little time for themselves in their eyes. It may seem that the female tendency to open up to others and have close relationships would decrease their levels of stress, since they have others to support them. However, according to Li and Lindsey, women may actually need to spend more time for themselves rather than devoting so much time and energy toward others. As females grow and progress through life, it is common that they spend the majority of their time meeting the needs of their family and friends, helping in whatever ways they can. Developing personal relaxation habits at the college level will be especially beneficial if the female can carry them on throughout her lifetime.

Males also need to integrate these health-promoting behaviors into their lifestyle. Research shows that male students typically participate in more recreational activities than females, but they would benefit from stronger interpersonal relationships as well. Misra and McKean (2000) state, "lower reaction to stressors for male college students may result from their socialization, which teaches them that emotional expression is an admission of weakness and not masculine" (pp. 48-49). Because of this feeling of weakness, males often repress their emotions, which can add to their stress level. However, it is not to say that males are incapable of having strong connections with others.

Other major differences between male and female students were determined by Misra and McKean (2000).

TABLE 1

Male	Female
• Lower state & trait anxiety • Higher satisfaction from leisure activities • Planning did not decrease stress level • Employed more stress management strategies than females ◦ More likely to take time for relaxation each day, use specific methods to control stress, & practice relaxation or meditation daily	• Higher self-imposed stress & more physiological reactions to stressors than males ◦ Sweating, stuttering, headaches • Goal-oriented females had less frustration • More efficient time management • Perceived better control of their time • Set & prioritized goals • Planned • Had an organized approach to tasks & their work space

Despite the gender differences, trait anxiety is said to be the strongest predictor of academic stressors among all students. Trait anxiety is described as a characteristic of personality that endures over time and is manifest across a variety of situations. Though different people experience varying levels of trait anxiety, females typically experience it more, which is likely due to their higher self-imposed stress.

A study was completed at Western Washington University to gain understanding of health promotion practices among college students. The relationship of stress and the practice of various health behaviors was also studied (Li & Lindsey, 2008). For both genders, establishing a lifestyle of routine health behaviors is important. Some examples of these behaviors are: get enough sleep, accept those things in my life which I cannot change, balance time between work and play, believe that my life has purpose, and spend time with close friends. While some are specific behaviors, others are certain ways of thinking. It is important to take the right actions to limit stress, but it also takes a positive mind. Although the study completed only examined the habits at one mid-size university and cannot be representative of the entire student population, it reported that male students engaged in physical activities, stress management, and spiritual growth activities more than females. This mirrors the fact that males tend to be less stressed; they usually take more time for themselves.

Managing Stress

Because various forms of stress impact students on a daily basis, individuals must learn how to manage them. As with most challenges, certain strategies work best for certain people. Stress can be understood in terms of a person's unique characteristics, experiences, and history, so all individuals must be evaluated separately. Misra and McKean found that "academic stress was lower for those college students with higher perceived control of time, low anxiety, who used their leisure time to learn and increase their knowledge, used an organizational approach to tasks, and preferred a well-organized workplace" (p. 47). Although college students are guaranteed to experience some type of stress, they can aim to reduce its effects by deliberately investing their time in roles or activities that are personally satisfying. This helps individuals counteract the continuing distress that they experience when an important area of life is filled with strain. In addition, withdrawing as much as possible from the source of problematic stress will be helpful.

One particularly helpful factor in modifying the impact of one's stress is social support. However, there is some inconsistency in exactly what this term means. Support generally comes when people's engagement with one another extends to a level of involvement and concern, rather than when individuals simply touch at the surface of each other's lives. Social supports nurture stress reduction when quality relationships are made and intimate communications, solidarity, and trust are formed (Pearlin, Menaghan, Lieberman, & Mullan, 1981). When experiencing stress, college students need assurance that others are willing to listen and talk. Although there is a long list of benefits, social support is actually decreasing (Chao, 2012, p. 6). According to Chao, "students with low social support were found more likely to engage in less healthy activities, such as sedentary behavior, alcohol use, and too much or too little sleep. These students are more vulnerable to stress than those who perceive high social support."

Another essential means of dealing with stress is coping. As Chao states, coping is effortful or purposeful thoughts and actions to manage or overcome stressful situations (Chao, 2012, p. 7). It is important to practice proper coping strategies in order to be effective. Some students do not want to reduce their stressors; in this case, it is vital that they increase their coping. Unfortunately, students often engage in dysfunctional coping, which typically results in one still feeling anxious because the stress has not been resolved. As Sideridis found, the five most frequent coping strategies among students to reduce stress are browsing the Internet, sleeping and resting, using instant messaging, complaining, and watching TV or movies (2008). These methods provide little or no effectiveness. Perceived stress and dysfunctional coping

are negatively related to psychological well-being. Research shows that even with high social supports, dysfunctional coping may deteriorate one's well-being.

A variety of other strategies are shown to help manage stress. Of course, some may work better for certain individuals than others.

- Physical activity
- Spiritual growth
- Positive thinking practices
- Problem solving
- Effective time management
- Engagement in leisure pursuit

Universities should also be implementing stress management techniques to help reduce stress overall. Seminars on time management could foster an improvement in academic success. Though certain colleges may already provide such opportunities, the events should be publicized and participation should be emphasized, or even required. Recreation centers could also participate in the stress-free movement by encouraging leisure activities for students. Having a planned, scheduled activity is generally easier for an individual to justify versus finding time for leisure on his or her own. VanKim and Nelson state that "college campus health services should integrate mental, physical, and social health components in order to encourage more holistic health among students" (2013, p. 14). This holistic health is significant, as it will provide balance to students' lives, decreasing stress in the process, and preparing them for a healthy future.

Limitations

Since each individual is unique, the research completed does pose limitations. The studies discussed in this essay were taken at small universities; therefore, they are not representative of college students at large.

CONCLUSION

College is a new and significant milestone in one's life. Along with this change, new or different sources of stress may also surface. Although completely preventing stress is unrealistic, many steps can be taken to minimize the frequency and effects of it. By discovering the methods of stress reduction that are most successful on an individual basis, students will find the college years more manageable and hopefully more enjoyable as well. Learning how to persevere through stress as a college student will also be beneficial as an individual enters the workforce. Whether it is the end of the day as a student, or the end of the day as an employee, we all want to be able to say, "I feel good."

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Property Investing in Minocqua, Wisconsin

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Abstract

Real estate investing is a potentially lucrative profession that can assist in building a person's wealth. This type of investing can be rewarding anywhere, but the purpose of this research is to find out what motivates a person to purchase an investment property in Minocqua, Wisconsin. Economic conditions in the area have vastly improved with 412 jobs added in 2013 and 16,452 people employed as well as a 2.4% increase in wages and even a fairly low cost of living (Walsh, 2013). The economy has been improving and the real estate market has significantly improved as well. "In 2007 only 5,981 listings were sold in comparison to 6,254 in 2013" and sale prices have also increased (Gores, 2014). The median sale price in 2013 was \$120,000, which shows a 4.2% increase from the lowest point in 2011 of \$115,000 (Gores, 2014). As of May 4, 2014, 21 listings have sold with a median sale price of \$125,000, which is also an increase of 4% (Interfacexpress). Additionally the town of Minocqua's real estate is currently valued at \$1.5 billion dollars (Town of Minocqua, 2014). All of this data leads to the conclusion that now would be an ideal time to invest in the Minocqua real estate market, because the economy and real estate market both show substantial improvement.

Keywords: Economic condition, Real Estate Market, Minocqua

Property Investment in Minocqua, Wisconsin

INTRODUCTION

Real estate investing is a potentially lucrative profession that can assist in building a person's wealth. This type of investing can be rewarding anywhere, but the purpose of this research is to focus on Minocqua, Wisconsin. Minocqua is located in northern Wisconsin and is known as the Island City, since the main part of the town is completely surrounded by water. This is where countless real estate investors purchase investment properties. Generally one would invest in properties in Minocqua to attract people vacationing during the summer and winter months. During this time, especially during the summer, spending is high on the consumer side and people will purchase or rent properties to reap the benefits of the area. Two potential

questions to answer are: *What motivates a person to purchase an investment property in Minocqua, Wisconsin?* and *Why would they choose to invest here rather than other parts of the United States?* "A subsequent question investors in the Minocqua area need to ask is: *Is an income-producing property a more sound investment than a non-income producing property in Minocqua, Wisconsin?* Throughout the current investigation, we will explore the options of what kinds of properties many investors choose to own and how a person can find a good investment in Minocqua, Wisconsin. Minocqua is an area in northern Wisconsin with, according to WisTravel, "One of the largest concentrations of freshwater bodies in the world with over 3,200 lakes, streams, and ponds." The town of Minocqua is specifically located in Oneida County near the northwest border. This area will be "a flourishing tourist destination, with a variety of accommodations from rustic cabins to luxurious condominium `suites," for many years to come. This area is arguably one of the most beautiful areas in North America because of everything it has to offer, from the outdoors including the woods for hiking, biking, and other adventures, and even a great downtown area full of shops that will appeal to everyone. During the summer, the population of Minocqua multiplies by a significant amount. This makes the rental market a great investment with many properties yielding over \$1,500.00 per week for a small cabin lakefront. Once you invest in a superior property, the sky is the limit. Northwoods Property Management is a business that provides property management to its customers who prefer to let a professional take care of the property and rent it while the owners are away. One of the properties, for example, is located on the queen of all lakes in Minocqua. This property yields \$3,000 per week. This is definitely a lucrative profession to get into, but there are numerous considerations including the economic conditions, the real estate market in the area, and other factors that may influence an investor's decision in purchasing a property; these will factors will be discussed below.

RESULTS ANALYSIS

Economic Conditions and Analysis

The economy is a major factor to consider when investing within a community. The hospitality, professional and business services, trade, transportation, utilities, and education industries mainly support the Minocqua area's economy. All of these industries are prominent in the state of Wisconsin where jobs have been increasing. According to Walsh (2013), "The state has added 122,000 private sector jobs since bottoming out in January of 2010." In Oneida County, 412 jobs were added just this year and 16,452 people were employed. Figure 1 depicts economic data for Oneida County that was discussed above.

FIGURE 1

Figure 1

	Employment		Total Payroll
	Annual average	1-year change	
Natural Resources	221	24	\$ 6,769,362
Construction	741	-1	\$ 30,551,368
Manufacturing	1,517	139	\$ 71,566,137
Trade, Transportation, Utilities	4,497	71	\$ 124,912,762
Information	265	-5	\$ 11,558,953
Financial Activities	553	7	\$ 21,118,237
Professional & Business Services	1,094	215	\$ 38,807,437
Education & Health	3,841	-73	\$ 167,203,478
Leisure & Hospitality	2,071	36	\$ 26,499,564
Other services	675	-22	\$ 12,602,034
Public Administration	978	22	\$ 39,583,541
Not assigned	0	0	\$ 0
All industries	16,452	412	\$551,172,873

Also, according to Walsh (2013), half of Oneida County’s employment and payroll comes from the two industries: leisure and hospitalities and trade, transportation, and utilities. Additionally, “it is also important to note that Oneida County cycles through a large number of temporary residents as vacationers flow into the county, mostly between Memorial Day and Labor Day” (Walsh, 2013).

Minocqua has numerous ways to bring in people during the fall and winter months by holding certain events that bring in thousands of guests to the area. One of these events is called “Beef-a-Rama,” which is hosted the last weekend in September. This one event alone brings in thousands of people to enjoy the area and see the entire town be involved in one large celebration. Another focus on the economy in this area is the wages. The overall average wages grew by 2.4%, and the total wages have also increased in most industries (Walsh, 2013). One other aspect to consider is that there are relatively low wages in Oneida County, a result of lower cost of living and differing industry-employment mixes that are more heavily concentrated with lower paying occupations (Walsh, 2013). Figure 2 confirms that the average wage is lower in Oneida County in comparison to the average wage for Wisconsin.

FIGURE 2
Average Annual Wage by Industry Division in 2012

	Average Annual Wage		Percent of Wisconsin	1-year % change
	Wisconsin Average Annual Wage	Oneida County Average Annual Wage		
All industries	\$ 41,985	\$ 33,502	79.8%	2.4%
Natural Resources	\$ 33,047	\$ 30,631	92.7%	-11.3%
Construction	\$ 51,670	\$ 41,230	79.8%	6.8%
Manufacturing	\$ 52,413	\$ 47,176	90.0%	-2.5%
Trade, Transportation & Utilities	\$ 35,946	\$ 27,777	77.3%	1.2%
Information	\$ 56,015	\$ 43,619	77.9%	2.6%
Financial Activities	\$ 58,493	\$ 38,188	65.3%	8.3%
Professional & Business Services	\$ 49,451	\$ 35,473	71.7%	12.7%
Education & Health	\$ 43,781	\$ 43,531	99.4%	3.3%
Leisure & Hospitality	\$ 15,221	\$ 12,796	84.1%	0.3%
Other Services	\$ 23,598	\$ 18,670	79.1%	5.3%
Public Administration	\$ 42,198	\$ 40,474	95.9%	-2.2%

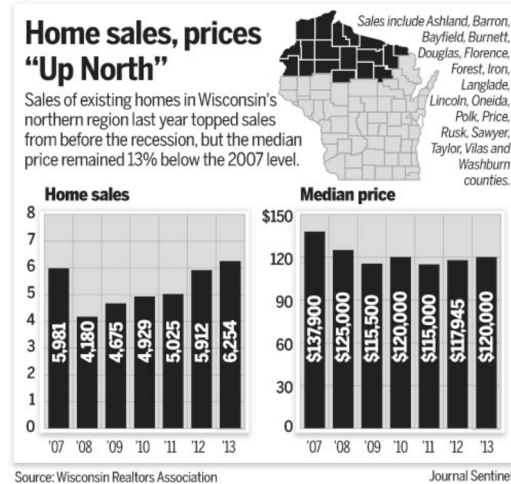
Source: WI DWD, Workforce Training, QCEW, June 2013

Real Estate Market Analysis

The real estate market is arguably the most important factor to have under consideration when investing in a property. According to Paul Gores, the real estate market throughout northern Wisconsin has been rebounding. Gores reports that last year sales topped the number of homes sold before the housing bubble in 2007. He also reports that there has been pretty consistent economic growth in northern Wisconsin. In-depth analysis of the market would show that currently in Minocqua, assessed property valuations now total almost \$1.5 billion (Town of Minocqua, 2014). Additionally, as of May 3, 2014, there are 319 active listings, 22 Active O/C (Offer Contingency), and 203 properties sold from January 1, 2013-May 3, 2014 (Interfacexpress, 2014). The median sale price is \$120,000 in 2013, which shows a 4.3% increase from the lowest point in 2011 of \$115,000 (Gores, 2014). Figure 3 is a graph created by the Wisconsin Realtors Association to show the relationship between the median sale price from each year as well as the amount of sales throughout northern Wisconsin. This chart also shows an increase in the number of sales from the peak of the market in 2007, where 5,981 listings were sold in comparison to 6,254 in 2013.

FIGURE 3

Figure 3



The real estate market has been recovering since the low in 2011. So far this year, 21 listings have sold with a median price of 125,000, which is an increase of 4%. The peak sale point hasn't even begun with summer on the way; real estate expert Erik Johnson predicts a "rise in prices between 3% to 5% this year" (Gores).

Rental Market Analysis

Minocqua, Wisconsin is a different place to invest in rental properties in comparison to a largely populated urban area. For most areas, a rental property consists of a property bought for the purpose of earning income on the investment. But in Minocqua, this is not always the case; for example, in the previously-mentioned case where Northwoods Property Management's rental property that originally sold for \$650,000 and rents for approximately for \$3,000 per week. This investment yields \$33,000 after expenses and would produce a cash-on-cash return of 5% without capital appreciation. On the other hand, investing in another location, such as a more populated area, would yield a similar profit for a lower initial investment. According to the Zillow.com article "What is a Good Real Estate Investment?" if you invested cash equity is \$50,000 and your overall income minus expenses is \$250 per month (\$3,000 per year), that's a cash-on-cash- return of 6%. Therefore, both properties are well worth the initial investment, since you can eventually sell the properties for a profit. Rental properties have the potential to reap a lot of benefits compared to other investments, such as stocks, because rental properties have a constant income each month.

Important considerations when investing in real estate

Property investing can be very worthwhile, but there are numerous things to consider when finding the ideal investment property for you. Two important factors are whether an income producing or a non-income producing property is the ideal option for the potential investor as well as the following. According to PR Newswire, when investing in real estate, a person must consider the following: pricing, renovation requirements, maintenance, location, and vacancy issues. One must also consider that you have to look at "the characteristics of the property, the market conditions at the time, and the specifics of your situation, investing in property may or may not be a lucrative decision" (PR Newswire). With this under consideration, one has to look at the condition of the property and whether it's in good condition or in disrepair. Many investors choose to renovate a property, thinking it will save them money fixing up the property themselves, but unfortunately for them, it doesn't usually work out because of unfavorable conditions. These conditions might be something simple, such as putting in new carpet or painting, but it can get very pricey once the investor is forced to put a new roof on, or if there is structural damage. All of these are the risks in purchasing an investment property, but that doesn't even begin to put an emphasis on how properties could potentially diminish the profit margin of the investor.

Income and non-income Producing

Income producing and non-income producing properties are the two main types of properties that investors have in their portfolio. "The most common type is an income producing property. Income producing are purchased by individual investors in the form of smaller apartment buildings, duplexes or even a single family homes or condominiums that are rented out to tenants" (Woychuk, 2009). This is very typical in Minocqua during the summer, since the population multiplies by many times over the current population. Additionally, spending is very high on the consumer side and these individuals end up renting lake properties that begin in the \$1,500 range per week. This will not change because of the fact that Minocqua is located in an area where "one of the largest concentration of freshwater bodies in the world with over 3,200 lakes, streams, and ponds" and is known as a "flourishing tourist destination, with a variety of accommodations from rustic cabins to luxurious condominium suites" for many years to come (WisTravel). Many of these rental properties in Minocqua are a great source of income and are considered to be a very sound investment. The other type is a non-income producing property. "Non-income producing investments, such as houses, vacation properties, or vacant commercial buildings, are as a sound as

income-producing investments" (Woychuk, 2009). The only way to make money from this type of investment is through capital appreciation. There is a downside to this type of investment, which is that the investor needs a sustainable income in order to be able to keep the property if purchased with a mortgage.

Pricing

Pricing is a very important factor for both income and non-income producing properties. A better look at income-producing properties will give the investor a better idea at how to price the property. A potential question to ask is: "How should I go about pricing my property for the rental market in Minocqua, Wisconsin?" There are numerous ways in which a property owner or investor can go about this. One option is to contact a local real estate agent and request for them to tour the property to give you an idea of the rental market condition, property condition, and an estimate for what the property will rent for. The other option is consulting with an expert in the rental market. Contacting a property management service would be an ideal place to start. They will come to your property and assess everything from the condition of the property to the likelihood of your home being rented based on the time of year and market conditions. Pricing is a very important aspect, especially in Minocqua since there will always be a lot of competition with hotels and other local resorts when renting on a weekly basis, but on a monthly basis, the only other concern is other property owners and investors.

Pricing can be complicated for a non-income producing property as well. According to experienced realtor Christopher Amberg, "overpricing a home can have many ramifications for a home seller. It can limit the number of potential buyers who can afford your home, reduce showings and create an impression in the marketplace that the home owners are serious about selling their home." For a non-income property this can be one of the most important factors in being able to move the property fast and make a larger profit margin, because time is money in the real estate industry.

Renovation

Renovations are another very important factor to consider for income producing and non-income producing properties. As explained above, if renovation is necessary, costs will significantly increase depending on the type of renovation, and would decrease the investor's overall profit margin. There are countless factors when going about renovation on any property such as the zoning laws in the area, obtaining a permit to build or reconstruct the property if deemed necessary, and even the time you invest into mak-

ing the property into a livable space. Zoning is a major factor when going about a renovation; this is especially true for on-water properties. One of the regulations restricting development of lakefront lots is chapter NR115 of the *Administrative Code* of the Wisconsin State Legislature. This law states "'shoreland' subdivision and zoning regulations shall: 'further the maintenance of safe and healthful conditions, control building sites, and placement of structure and land uses and reserve shore cover and natural beauty'" (NR 115.01). The regulation also goes on to say in section 8 that "Shorelands" means within the following distances from the ordinary high-water mark of navigable waters: 1,000 feet from a lake." This piece of law makes it very difficult to work on properties that are within 1,000 feet of a lake, although there are exceptions to the law if the building is already constructed. If the building is already constructed, you are then able to reconstruct the property as long as the existing foundation of the property remains. The reason for this law is to protect the lakes, streams, and other water sources from being polluted. This does create a lot of trouble when investing in lakefront properties, which can yield larger profits when purchased.

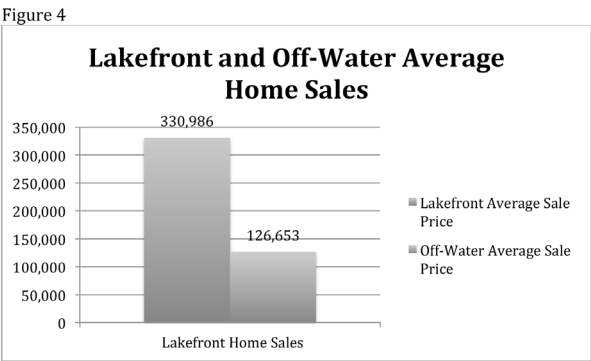
Renovations are very serious for a property investor, whether they are doing it for a non-income producing property or a rental, either way it is costly and the expenses will rapidly accrue. Obtaining permits for construction can be a very difficult thing to undertake. Oneida County is not very willing to issue permits unless deemed absolutely necessary. This does create a lot of problems for investors going about a renovation. The other factor is the time being invested into the property. Overall, renovations can be a very difficult thing to undertake, especially in Minocqua, and should be handled with the utmost care and consideration.

Maintenance

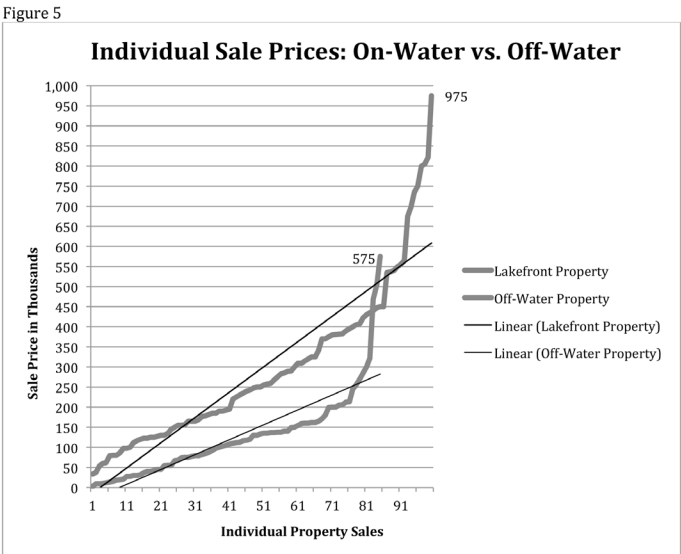
Maintenance on a property can be very costly, and can significantly diminish a property's value if not dealt with in a timely manner. Maintenance refers to the upkeep of a property such as a home, apartment, or other building. Many of the small tasks such as maintaining the lawn, washing windows, and others are considered small maintenance but can add up to a large quantity of money over time. Not only are those types of maintenance costly, but if one decides to do it themselves, the work will be very strenuous. Hiring a property management company may be convenient, but it can be expensive. Other forms of maintenance can be replacing a roof, repairing damage, and even renovating the interior. All of these are pricey and can be an influential factor when investing in real estate.

Location

Another factor to consider is location. The main issue in location for Minocqua, Wisconsin is whether the property is on-water or off-water. The difference between these two is significant. The initial investment into the property will be considerably higher if it is waterfront. An example of this is shown in the article written by Paul Gores where he interviews many influential realtors about the real estate market in northern Wisconsin. In an interview with Erik Johnson, president of the Northwoods Association of Realtors, Johnson said, "Buyers are looking for lake homes in Oneida and Vilas Counties, where prices have been pared considerably from pre-recession levels, and last year had an average sale price of \$307,000." This sale price reflects the overall average sale price in the counties around Minocqua, but within the township, the average sale price from January 1, 2013 to May 4, 2014 was \$330,986 (Interfacexpress, 2014). Figure 4 represents the average sale price of lakefront



Assuming that a person would be investing in the community of Minocqua, something to note is that lakefront properties' sale price is higher than off-water property. Another graph documents every sale from January of 2013 to May 4, 2014 for off-water and lakefront property.



The trend lines on the graph show the comparison in the slope of the price between off-water and lakefront property. All of this data confirms lakefront properties are sold for a substantially higher price than off-water, and signifies a larger total investment. Although lakefront properties seem like a large amount of money to invest, according to Johnson even with a large initial investment, a property's values are likely to increase. As mentioned above, lakefront properties can be a very lucrative investment.

Vacancy Issue

The other factor is vacancy. This doesn't have a very large impact on the Minocqua, WI real estate market, but according to Walsh, 2013, "There are about 32,200 total housing units in Oneida County. An estimated 12,300, or 41 percent, of the housing units are used for seasonal, recreational, or occasional use. Increasing the number of days spent in these would stimulate the local economy by bringing more outside money into the county's shops and restaurants. There are current strategies that focus on increasing the number of days in which seasonal or recreational homes are occupied." Most of the time, vacancy issues are in areas where many properties are sitting vacant and are not likely to turn around fast. An example of this can be shown during the real estate bubble of 2007-2009 where "rising home prices led to rampant real estate speculation (Beattie)." These homes were sitting vacant for a long time until property investors purchased them and made them into

investment properties. As stated, vacancy issues do not have a heavy impact on the real estate or rental market in Minocqua, Wisconsin, but for other markets, it is something to research and be knowledgeable about because it definitely affects the market.

CONCLUSION

Minocqua, Wisconsin is a great place to invest in real estate as shown by the facts above. There are numerous things to consider before investing within a community and that leads to the questions: *What motivates a person to purchase an investment property in Minocqua? Why would they choose to invest here rather than other parts of the United States? Is an income-producing property more lucrative than a non-income producing property in Minocqua, Wisconsin?* These questions assist in pinpointing whether Minocqua is the perfect place to invest for the potential investor.

First of all, one must look at the consistent economic growth, and growth within the real estate market. The economy has grown by adding jobs, increasing wages, and even a fairly strong per capita income, considering it's a mic

Figure 6



This is a great factor since investors would prefer to invest within a prospering economy instead of one that's in an economic decline.

The other factor to consider is the real estate market and the current market conditions. In Minocqua the real estate market has been increasing substantially since the lowest part of the recession. The current valuations of property in the township amounts to approximately \$1.5 billion, as of 2014, and the valuations of properties will increase as the market returns to its pre-recessionary state (Town of Minocqua, 2014). The market prices have also been increasing as the sale prices and number of sales have been increas-

ing. Data from *Interfacexpress* explains median price have increased by 4% so far in 2014 and prices are expected to rise even further. This will assist in explaining why a person should invest in Minocqua's real estate market.

Minocqua is full of recreational opportunities and events that bring tourists and investors to the area alike. It's an area of the United States where there are over 3,200 lakes, streams, and ponds, which makes it one of the largest concentrations of freshwater in the world (WisTravel). Minocqua is a very unique place to invest and will be, for many years to come, "a flourishing tourist destination, with a variety of accommodations from rustic cabins to luxurious condominium suites." Not only does that bring investors to the area, the potential to make money off of the property market does too. Income and non-income producing properties are the two types of properties an investor can possess. Income producing is a more sound investment than a non-income producing, as it's a more self-sustaining investment option. Although a non-income producing property has its advantages too. The investor doesn't have to worry about damage being done by tenants. Both options are good for an investor, but it depends on the investor's individual situation. Overall, throughout my research, it was difficult to determine whether income-producing or non-income producing properties are more lucrative than the other considering there is no preexisting data for the rental market. In conclusion, property investment into a community like Minocqua, Wisconsin with the economy and real estate market turning around would be a very wise investment and is highly suggested.

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The World May Never Know Unwrapping the Mystery of the Tootsie Pop

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ABSTRACT

There is a surprising amount of research available on the number of licks it takes to reach the center of a Tootsie Pop (Zyra, 1996; Waksman, 2009; Tootsie Roll Industries, n.d.). Yet, many of these studies have a large amount of inconsistency in the number of licks it actually takes. I conducted research in order to mathematically find how many licks it takes to dissolve each millimeter of a Tootsie Pop. With that number, I determined that two different methods of licking resulted in 124.74 and 39.91 licks per millimeter to reach the center. Combining the more effective 39.91 licks per millimeter method with the average width of a Tootsie Pop, 8 millimeters, I concluded that the average number of licks to reach the center of a Tootsie Pop is 319.28. Discovering that Heid (2013) had licked the thicker side of the Tootsie Pops during his research I adjusted the average width from 8 to 10.5 millimeters. Using this final piece of data I determined that my new average number of licks, 419, confirmed Heid's average of 417 licks.

Key Words: Tootsie Pop, LPmm, Heid, licks, Tootsie Roll, Miley

Literature Review

Life is filled with many great mysteries, but perhaps the greatest question of them all is, "How many licks does it take to get to the center of a Tootsie Pop?" This question has been a popular advertising campaign of Tootsie Roll Industries since 1970, and a consistent answer hasn't been discovered (Tootsie Roll Industries, n.d.). The literature I found on this subject consisted of Internet-based sources found through a Google search, as there are very few useful scholarly sources. The literature focused on licking tests, which were performed to find an exact number of licks required to reach the Tootsie Roll center. These tests produced inconsistent results (Zyra, 1996; Waksman, 2009; Heid, 2013; Tootsie Roll Industries, n.d.).

Zyra (1996) conducted an experiment using students attending Swarthmore College in Pennsylvania. Twenty-two trials were carried out in which each participant would lick one or both sides until the Tootsie

Roll center was exposed. Each participant was given an index card to tally how many licks they had taken, with the ground rule set that the sucker could not be placed fully into their mouths. The study found that the amount of licks to reach the center ranged from 70-222 licks. The average number of licks comes out to be 142.

Waksman's (2009) tests involved 22 trials of how many licks it takes to reach the center of a Tootsie Pop. New information was also given with each trial such as color, date, and on some occasions, the amount of time the trial took. The end goal of the experiment was defined as when the texture, taste, and discoloration of the Tootsie Roll were visible. The limitation of not placing the sucker completely in the mouth was also a restriction for this experiment. The experiment involved licking both sides of the sucker back and forth, while counting the total licks before both sides had reached the goal. The results of the total licks to reveal both sides were 508, while the average for one side was 254.

Heid (2013) gives an overview of previous research before the experiment is explained. Heid (2013) details the two types of testing methods, which have been used: licking machines and human lickers, and presents the data of well-known tests of both kinds. Purdue, the University of Michigan, and Harvard all created licking machines and found the average to be 364, 411, and 2255 licks, respectively, to reach the center. Purdue, Swarthmore, and Cambridge conducted human tests that found 252, 144, and 3481 licks, respectively.

This wide range of results led Heid (2013) to pursue an experiment, which tested the effects of the force of the lick, temperature of the licker's mouth, pH level of saliva, and the solubility of saliva. The only one of these tests that gave measurable results was the solubility of saliva, which had little to no effect on the average licks. The 70 participants ended up with an average of 361 licks, with the highest number of licks being 1087. Heid (2013) then concluded that the amount of licks does not depend on the person licking, but on how centered the Tootsie Roll is in relation to the Tootsie Pop, and therefore, which side the participant starts licking on.

Unhappy with the standard deviation of 186 that he had found, Heid (2013) sliced the Tootsie Pops open and found that size of the Tootsie Roll center varied between suckers. Heid (2013) found the thick, banded, longitudinal side of the Tootsie Pop to have more consistent measurements. With this in mind, Heid (2013) began a new series of tests, in which participants licked along the thick, banded, longitudinal side of the Tootsie Pop. The test results were much more consistent and

only had a standard deviation of 39 licks (2013, Heid). Heid (2013) concluded that the average number of licks to reach the center of a Tootsie Pop is 417.

Tootsie Roll Industries (n.d.) provides general information about their product and attempts to reach the center. The information consists of questions, which Tootsie Roll Industries are frequently asked. Different questions, such as how the company got its name, or simpler questions like, "Do any of your products contain nuts" are also addressed. Some facts about production are included on this page, specifically that 64 million Tootsie Rolls are manufactured every day. The actual question, "How many licks does it take to get to the center of a Tootsie Pop," is answered with the vague statement that it depends on the size of the mouth and the amount of saliva. Since the commercial aired in 1970, Tootsie Roll Industries has received over 20,000 letters from children who claim to know how many licks it takes. The average for these attempts is between 600-800 licks, with lows around 100 and highs reaching around 5,800. Each child that sends them a letter stating they completed the challenge is presented with a certificate with the signature of "Mr. Owl's" feet.

With the average number of licks ranging from 142 to 3481, the current literature fails to come to a conclusive answer to the question, "How many licks does it take to reach the center of a Tootsie Pop." Heid (2013) identified an inconsistency in the size of the Tootsie Roll center, which could have been the cause of the variation of other studies, as well as his own. Current literature lacks a consistent and mathematical approach towards finding the average number of licks and has not taken the variation in Tootsie Pop width into consideration (Zyra, 1996; Waksman, 2009; Heid, 2013; Tootsie Roll Industries, n.d.).

Purpose Statement

The purpose of this research was to determine the average licks per millimeter by dividing the average number of licks by the distance to the center of the Tootsie Pop. With Heid's (2013) discovery that not all Tootsie Pops are equal in size, the location of the Tootsie Roll seemed to have a significant role in the number of licks required to reach it. Using the licks per millimeter (LPmm), the average number of licks would be possible to calculate based on the average size of a Tootsie Pop.

Method

The research was divided into three stages. The first stage of the research was conducted in order to find initial data regarding the proportions of the Tootsie Pops. Licking tests were also carried out by myself to

determine an average number of licks to the center of the Tootsie Pops, as well as the average number of licks to clear an entire side of the sucker-off. These two averages were recorded to account for possible variations in the perceived reaching of the Tootsie Roll center done in previous research. The average number of licks was then divided by the measurements of the Tootsie Pops' shell width to determine the LPmm. The second stage of research had 20 participants perform the lick test in order to compare the average number of licks to the first stage of research. The third stage involved cutting each of the Tootsie Pops from stage two in half with a heated knife to determine the width of the Tootsie Pops and calculate the LPmm to compare with the LPmm from stage 1.

PICTURE 1



Five Tootsie Pops were sliced in half across the width of the sucker using a heated knife at the start of the first stage as seen in the picture above. Measurements were taken of the overall width, height, and length of the Tootsie Pop, as well as the width of the candy shell. Tootsie Roll dimensions was also measured. After each of the first five Tootsie Pops was sliced in half, I licked each of them to the center, noting the number of licks it took to reach the center, along with the number of licks it took to clear an entire side of the candy shell away from the Tootsie Roll. The number of licks was then divided by the shell width licked through,

which gave a measurement in LPmm. After the initial tests were complete I concluded that the average LPmm to the center of the Tootsie Pop was 137.81 and 175.31 LPmm to clear away the entire side of the sucker. The second stage of research began with each participant receiving a sheet of instructions for the individual licking tests. Participants were to count each lick and mark down the number of licks to reach the center of the Tootsie Pop, as well as how many licks it took to clear an entire side off of the Tootsie Pop shell. The participants were not allowed to place the entire sucker in their mouth at any time. A plastic bag was given to each participant and every test sucker was collected after the test was completed. The participants that carried out the test were all college students between the ages of 19-29 of both sexes. Thirteen tests were carried out during the second stage of research.

Once each of the test suckers was collected and the number of licks was recorded, the third stage of research began. The sucker was sliced in half with a heated knife and measurements of the remaining widths were taken and compared with the average width from the first group of Tootsie Pops. This comparison provided an approximation of how many millimeters of candy shell were licked through. The number of licks to reach the center was then divided by this approximate thickness to produce a measure of LPmm. The measure of LPmm from the second stage was then compared to the initial data from the first stage of research.

RESULTS

The results of the first stage of research are in Table 1 below. The first number in the Licks and LPmm columns is the initial point at which the Tootsie Roll is revealed, while the second number represents an entire side being revealed. The LPmm from A3 was thrown out as a result of a poor knife cut.

TABLE 1

T#	Shell Width	Licks	LPmm
A1	5mm	600~850	120~170
A2	8mm	1100~1350	137.5~168.75
A3	8mm	1750~2000	218.75~250
A4	8mm	1150~1400	143.75~175
A5	8mm	1200~1500	150~187.5

The data in Table 2 contains the measurements taken from the first group of Tootsie Pops. There are no measurements for Tootsie Pop A1. The averages for each category are listed at the bottom of Table 2.

TABLE 2

Sucker Length	Sucker Width	Sucker Height	Tootsie Roll Length	Tootsie Roll Width	T#
29mm	26mm	30mm	20mm	10mm	A2
30mm	25mm	30mm	20mm	10mm	A3
30mm	27mm	30mm	15mm	13mm	A4
29mm	27mm	30mm	15mm	11mm	A5
Ave. Sucker Length	Ave. Sucker Width	Ave. Sucker Height	Ave. Tootsie Length	Ave. Tootsie Width	
29.5mm	26.25mm	30mm	17.5mm	11mm	

Twenty participants were recruited to lick to the center of the Tootsie Pop while recording their licks. After two weeks, nine of the test suckers were received with the recorded number of licks. Eleven participants became impatient with the process and ate the sucker in a similar fashion to the original commercial. Table 3 contains the data from the second stage of research, which involved the tests of the participants. Tests B10-B13 were carried out personally after a discovery into alternative licking styles. The Shell Width Approximation is obtained by subtracting the Remaining Width from the Average Sucker Width.

TABLE 3

T#	Licks to Center	Licks to Clear	Remaining Width	Shell Width Approximation	LPmm to Center	LPmm to Clear
B1	1350	1500	18mm	8.25mm	163.64	181.82
B2	1850	2300	17mm	9.25mm	200.00	248.65
B3	312	825	18mm	8.25mm	37.82	100.00
B4	1000	2150	17mm	9.25mm	108.11	232.43
B5	755	1952	15mm	11.25mm	67.11	173.51
B6	700	1146	18mm	8.25mm	84.85	138.91
B7	131	318	20mm	6.25mm	20.96	50.88
B8	428	500	18.5mm	7.75mm	55.23	64.52
B9	514	732	18mm	8.25mm	62.30	88.73
B10	90	180	24mm	2.25mm	40.00	80.00
B11	180	330	17mm	9.25mm	19.46	35.68
B12	390	510	17mm	9.25mm	42.16	55.14
B13	300	510	19mm	7.25mm	41.38	70.34

DISCUSSION

After completing the first stage of research, it seemed that the number of licks I had gotten was much higher than most of the other research done. Previous research had taken between 142 to 417 licks on

average to reach the center with two extreme averages of 2255 and 3481 licks (Zyra, 1996; Waksman, 2009; Heid, 2013; Tootsie Roll Industries, n.d.). During my first stage of research it had taken between 600 to 1750 licks to reach the Tootsie Roll center, and between 800 to 2000 licks to clear an entire side of the Tootsie Pop. Because of Heid's (2013) information regarding the placement of the Tootsie Roll center, I decided to ignore the number of licks it took, as it is relative to the thickness of the candy shell. I was confident that the number of licks was perhaps a result of thicker shells. Taking the average LPmm of the first five tests, I found that the average LPmm to reach the center was 137.81 and 175.31 LPmm to clean away the entire candy shell on the same side. As the measurement of LPmm was fairly consistent with a standard variation of 12 LPmm, I was confident that these numbers would be backed up when compared with the results from stage two.

Once the data from the first stage was recorded, the second stage of research began. The results that I received from the participants were not what I had expected. While a few of the results were in line with the data obtained from the first stage of research, the vast majority of them weren't even close. The LPmm to reach the center ranged from 20.96 to 200 while the LPmm to clear a side of the Tootsie Pop ranged from 50.88 to 248.65. Tests during the first stage took around 1500 licks to clear a side but one participant had managed to clear the entire side off of the Tootsie Pop in only 318 licks. This disparity in licks was even more puzzling, as the suckers I had received back had all been done in accordance with the instructions I had distributed. I theorized that either the participants had miscounted due to human error, or I had miscalculated.

It wasn't until I talked with one of my final participants that I had a revelation. This particular participant had asked if it mattered whether they put their tongue back in their mouth in between licks. The results were astounding. A task that once took 1500 licks now took a mere 330 licks to complete. It turns out that bringing the tongue back in the mouth between each lick dramatically increases licking efficiency. I continued the tests from stage two and recorded tests B10 through B13, for a larger sample size, with my newfound knowledge.

I went back over participants B1 through B9 and asked each of them whether they brought their tongue back in their mouths between licks. I was then able to categorize each test from stage one, as well as stage two, based on whether the participant put their tongue back in their mouth between licks, or kept their tongue hanging out the whole time, which I dubbed the "Miley" method. Nine of the tests were done using

the Miley method, while the other eight placed their tongues back in their mouths between licks. Taking the average number of licks from the five tests in, which the participants utilized the Miley method, I found that their LPmm was 124.74 to reach the center and 195.06 to clean a side off of the sucker. This was quite close to the original data from stage one of 137.81 and 175.31 LPmm. When averaging the tests, which did not utilize the Miley method, I found that it took 39.91 LPmm to reach the center and 68.16 LPmm to clear a side of the sucker off. This means that the Miley method of licking requires between 2.73-3.27 times more licks than placing the tongue back in the mouth between licks. This revelation into different licking methods creates consistency within both methods and makes sense of seemingly inconsistent data.

As a result of Tootsie Pops having irregular centers, it can be hard to pinpoint an exact number of licks required to reach it. Using the average dimensions of Tootsie Pops found from the first series of tests, the center of the perfect Tootsie Pop is 7.625 millimeters from the outside of the shell. Averaging all 17 tests found a similar result of 7.868 millimeters. Assuming that Tootsie Roll Industries intends for the width on both sides of the Tootsie Pop to be a perfect 8 millimeters, it would take approximately 319.28 licks to reach the center or 1044.4 licks using the Miley method. This is slightly lower than Heid's (2013) 417-lick average but unlike Heid, my tests were done using the side of the Tootsie Pop without the thick, banded part of the candy shell, which is smaller.

I measured how thick the band on the Tootsie Pop was, finding it to be 2.5 millimeters thick. This means that the average distance to the Tootsie Roll center of the thick, banded side of the Tootsie Pop is found by adding the 2.5 millimeters to the average unbanded side of 8 millimeters. I multiplied my calculated LPmm of 39.91 in with the distance to the Tootsie roll center, 10.5 millimeters, which Heid would have licked through. The results were incredible. Using my LPmm I found that it would take Heid approximately 419.06 licks to reach the center of the Tootsie Pop, which is a mere two licks off of what his research actually found. The data, which I have collected, gives Heid's (2013) work much more credibility. Not only did his work feature a very small standard deviation, but is now backed up based upon my personal research into LPmm.

With these two pieces of information in mind, it can be said that an average sized Tootsie Pop requires about 419 licks to reach the center when placing the tongue back in the mouth between licks and licking along the thick, banded, longitudinal side of the sucker. Licking along the adjacent unbanded side of the Tootsie Pop while placing the tongue

back in the mouth between licks requires about 319.28 licks to reach the center. LPmm can also be used to determine how many licks it will take to reach the center of even the most irregular Tootsie Pop, such as Tootsie Pop B10 found in Table 3 in the Results section. I licked this Tootsie Pop myself and noted beforehand that the stick was diagonal within the sucker, bringing the Tootsie Roll almost to the surface. Even with a Tootsie Pop that bizarre, the LPmm still came out to 40. This concept can also be applied to more outrageous situations.

Suppose the earth was made of Tootsie Pop, how many licks would it take to reach the center? This is not the type of question, which comes to mind often, but out of curiosity I decided to do the math. On average, the distance to the Earth's core is 6.371 billion millimeters. Using the Miley method it would take approximately 832 billion licks to reach the center and 254 billion licks while placing the tongue back in the mouth between licks.

Limitations and Implications for Future Research

Measurements were done using a ruler, which opens up the possibility of human error while measuring. Expensive equipment could be used to reach a better measurement. While the results from these tests were consistent with one another, the sample size of participants was rather low. I would encourage others to lick while trying either method and then measure the distance and compare the LPmm to my data. While my research has backed up Heid's (2013) research, more tests need to be done to ensure truly accurate results.

CONCLUSION

With the work that Heid (2013) did finding the average amount of licks to reach the center to be 417 and my research saying 419, it can be safe to assume these can be very reliable answers to the question, "how many licks does it take to get to the center of a Tootsie Pop?" If the Tootsie Pop is irregularly shaped, the 39.91 LPmm can be a reliable way to create an estimation of how many licks it will take to reach the center. For those bold enough to use the Miley method, 124.74 LPmm should give a close approximation. Next time someone answers this question with "the world may never know," don't be a sucker; the answer is approximately 419 licks.

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Animal and College Student Emotional Relationship: Path to Pet Therapy on Campus

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ABSTRACT

Many college students experience high levels of stress and/or homesickness in their first two years of college. When students experience this emotional state, they may begin to identify as someone who has anxiety and/or depression. Students who are new to the college environment often find relief in a form of familiarity. A family pet holds a permanent bond of perceived unconditional love and affection for their owners. The purpose of this study is to explore the emotional bond a new college student has with animals while away from home and to see if animal interaction while at college helps reduce stress and/or homesickness. This could ultimately help lower the number of college students who experience anxiety and/or depression. The methods used for this study were a) a randomized survey of 102 freshmen and sophomore college students at UW-Stout and b) a pet therapy session with those who indicated on the survey they would like to participate. The results showed 92% of freshmen and sophomore students with pets at home believe interaction with a pet would help reduce their stress levels and/or homesickness. However, even 50% of students with no family pet at home indicated that pet interaction would help lower stress and/or homesickness. The focus group sessions indicated having animal interaction would help the residents cope with stress. This research suggests pet therapy would be a beneficial addition to the Stout campus to help reduce the number of freshmen and sophomore students who are experiencing stress, homesickness, anxiety and/or depression.

Key Words: College Student, Animal, Pet Therapy, Stress, Homesickness, Anxiety, Depression.

BACKGROUND

College Students: Stress, Homesickness, Anxiety and Depression
Students who are beginning college are embarking on a new lifestyle that is different from what they have experienced previously. College is not just limited to the student's academics; there are multiple factors that go into determining a positive experience for each student (Cramer and Prentice-Dunn, 2007). For many college students, they are leaving what is

familiar and comfortable to them in exchange for a new environment with a different type of lifestyle and a new support system. For most this transition can be embraced and celebrated, but for those who struggle with it, homesickness and stress are often an outcome (Beck et al., 2002 and Urani et al., 2003). Homesickness includes having feelings of loneliness and emotional distress along with thoughts about home (Fisher, 1989.). These thoughts can make the student feel lonely, with the possible result of exhibiting symptoms of anxiety and/or depression (Eurelings-Bontekoe et al., 1996). If students who have anxiety and/or depression ignore their condition, it can lead to poor physical well-being (Rawson and Bloomer, 1994 and Hussain et al., 2013).

Human-Animal Relationship

The animal-human relationship can be described in many different forms, from the animal's place in a family to their place in the world; all people have a relationship with animals. Some literature even suggests that animals help bring out the humanity in people beginning during the childhood years (Menefee, 2008). When a person is a young child, animals tend to hold a strong yet different bond than adults' relationship with animals. Children often view animals as similar to themselves and assign to them a sense of personhood (Tipper, 2011). They will act as if their pets are a person in the family by treating them like a brother or sister. This concept fades as people age, but they carry with them this idea of personhood they have assigned to animals as children. For people who grow up having pets in their family, pets become familiar figures which provide them with a feeling of comfort, and a sense of attachment. This demonstrates what we would predict with attachment theory since the person is provided with a sense of security by their pet (Conners, 2011). People also see this in those who have assistance animals for a physical disability.

Assistance and Companion Animals

Many people who own assistance dogs depend greatly on these animals (Kwong and Bartholomew, 2010). People who have mental disabilities also experience this form of attachment, although their animals are not considered assistance animals but rather companion animals. Companion animals' purpose is to aid people's physiological health needs by promoting the reduction of stress, anxiety, depression, and loneliness through interaction with their owner. Many nursing homes and veteran homes use companion animals to help those residents who are mentally unstable (Le Roux and Kemp, 2009 and Yount et al., 2012).

Pets at Work and on Campus

Traditionally people with physical disabilities are the only people allowed to have animals in prohibited areas of a society such as stores, schools, and special events. In recent years however, the benefits of pet interaction have been recognized as beneficial for communities, and it is slowly being integrated as a societal norm. There are a variety of work-places allowing pet owners to bring their animals to work in order to help them and their co-workers cope with daily stress (Wells and Perrine, 2001). The simple engagement with an animal can help lower one's blood pressure leading to initial stress relief (Somervill, et al., 2008). However, it is not just the workplace that has been extending its welcome to pets; colleges have begun to allow companion animals on campus in many different forms. A select few campuses are allowing students to bring their pet with them to college because they recognize that pets reduce homesickness (Steinberg, 2010). Campuses are starting to have pet therapy, which allows for a nontraditional coping mechanism for students (Adamle, et al., 2009). Participating campuses have reacted positively to the idea of having animals around to help their college students' apprehensions towards college. People on campus who interact and see therapy animals find the environment more comfortable and friendly (Wells and Perrine, 2001), which in the end could lead to a happier campus population. The purpose of this study is to explore the emotional relationship a new college student has with animals while away from home and to see if animal interaction while at college helps reduce stress and/or homesickness.

METHODS

Survey

This research involved Institutional Review Board approved quantitative and qualitative research methods. In order to better understand students' transition from home to college, I surveyed 718 freshmen and sophomore students from the University of Wisconsin-Stout. I surveyed freshmen and sophomores because they are the newest additions to campus, but also they are required to live in the dorms. The questions asked on the survey covered multiple demographics of the student's life. The students were asked to identify their academic year, how far they lived from home, number of roommates, and the type of housing they live in (some students are exempt from living policy, which allows them to live off of campus, meaning they have the opportunity to house a pet. The survey then asked the students if they have a pet at their family home. Students that answered "yes" then took a different survey than those who

of pet(s) their family has and age of the pet. Then they were asked to identify how the pet(s) impact their mood on a daily basis, how much they miss and/or think about their pet(s), and then given several scenarios about their pet(s). Students were asked if they also thought it would be a good idea to bring their pets to college with them. Other than those questions about the students family pet(s), the rest of the two surveys were the same. Students were asked to select an emotion to describe each of two photos and why they chose it (see figure A).

Figure A



The photos both were selected to bring out the positive association between an animal and a human. The rest of the survey questions were focused on the student's stress level and what they do to reduce their stress, homesickness level, and whether they self-identify as having anxiety and/or depression. The final section asked the students if they believe interaction with a pet would reduce their stress, homesickness, anxiety and/or depression and to provide their email if they would like to try pet therapy in a focus group setting.

Focus Group

The students who indicated they would like to participate in a focus group were then contacted by email to select one of the three offered sessions. Sessions were held on campus in a small room creating a more intimate setting in hopes of making the students feel more comfortable. Upon arrival, students entered the building and went over the consent form before being exposed to the dog used for the sessions. After all students had arrived and agreed to the terms on the form, they were taken to the room to meet Rocko. Rocko is my family dog from home and has no companion dog training. However, Rocko is an extremely obedient dog with a strong desire for attention from any and all humans. After the

initial encounter with Rocko, students were asked to sit in a semi-circle allowing Rocko to have access to everyone in the room. Each student was given a treat to give to Rocko when directed to in order to regain his attention and to help even out Rocko's time with each student. The participants were asked a series of questions aimed at better understanding how college has been for them so far. The questions included: What has the transition from home to college been like for you (i.e. emotional/physical state, relationships, daily routine)?, How has your stress level been while at college (i.e. social life, academics, overall well-being)?, Do you believe pet therapy (or something like it) would be useful at Stout (i.e. why/why not, types of animals that would help and where on campus)? While students answered the questions and interacted with Rocko, I took notes on their behaviors and overall reactions to the situation. Sessions lasted approximately 15-20 minutes and then students were allowed to leave or stay and continue interaction with Rocko until they felt satisfied.

RESULTS

Survey of 102 students responded to the questionnaire (14% response rate), including 59% freshmen, 33% sophomores and 8% transfer students that were considered a freshmen or sophomore academically. Out of all the responses, 84% have a family pet at home, leaving 16% that do not. Of the 84% with pets, 92% believe that interaction with a pet would help lower their stress, homesickness, anxiety and/or depression. Of the students who do not have pets at home, results were split 50/50 whether or not interaction would help them with lowering their stress, homesickness, anxiety and/or depression.

This indicates that a large percentage of students believe interaction with animals would help them through the changes they are experiencing during the transitions from home to college. For those students with family pets, 91% indicated that their pets have a positive impact on their mood. These students also indicated high levels of missing their pets (Figure B). When asked if they could have their pet on campus, how would it make them feel, students answered with a generally positive response (Figure C).

FIGURE B

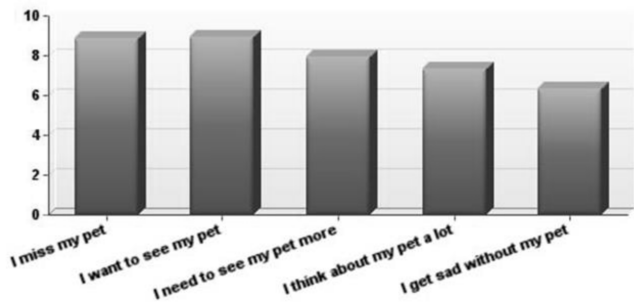
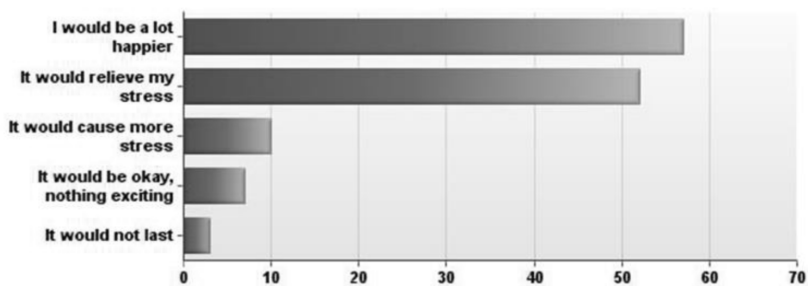


FIGURE C



Overall, when asked to describe the image of the young boy and the puppy, students selected loving, feel-good and relaxed. When asked to explain why they identified the image as the selected emotion, responses were generally the same. Some examples of student's responses are:

"I chose relaxed because I am always relaxed and cozy when I snuggle up with my dog."

"I chose loving because the characters in the picture clearly have a strong loving and trusting relationship."

"Because it shows just how much the little child and the dog really care for and trust each other, they both are relaxed and love each other a lot and from that they can fall asleep together in comfort and ease."

"The dog is so cute and often my dog likes to cuddle with me as well, he also misses me."

"Because I have been in the exact position with my pets. It's a special loving bond that you share with them."

When asked to describe the image of the man and his assistance dog, most selected loving and feel-good, but a few selected upsetting, stressed and sad. The negative selections were justified as either: sympathizing with the human, because he is in need of assistance or sympathizing with the dog by assigning it subconsciously with personhood and assuming its feelings. Descriptions included responses like the following: *"The dog and the human looked like they had a hard time, and were overcoming it together."*

"My dog could read my emotions and knew exactly how to react to make me feel better."

"It shows the strong bond that these two share without any words and you can tell they both understand whatever is happening at that time in a shared emotion."

"No matter what happens, your pet will always be there for you."

When asked to rate their level of stress and homesickness, results overall were constant with no real outlier. This could be because the survey took place over the beginning of second semester, so this was a time that students had just been home along with a lighter academic load (unlike what it would be around finals). However, stress levels were a bit higher than homesickness or no clear reason. Of those who completed the survey, 54% identified as having a mental illness (anxiety and/or depression). Out of the 102 responses, 20 students indicated they wanted to try a pet therapy session.

Focus Group

Out of the 20 students who signed up for a pet therapy session, 15 attended the focus group. Session one was held the week before spring break and had a total of 7 students, 5 females and 2 males. Students were asked the first question about how their transition to college has been. Most agreed it had been hard at first, but as they started to develop friendships, it has become easier. However, those who had family pets told me the hardest part has been being away from their pets and lacking the secure perceived unconditional love around anymore. I asked the group if they missed their family members or their pets more and those

with pets agreed they missed their pets more. When students were asked about their stress levels, they all agreed that they are relatively high due to the exams that were taking place at the time.

"The school work's not so bad, the exams are what get me."

"I feel the same. With exams coming up, I am really feeling the stress."

I then investigated if these students would feel less stressed if they were studying somewhere that had access to an animal. Most liked the idea, but some thought it might be distracting unless they knew what times the animal would be there so they could plan accordingly. I then asked what is it about having an animal around that they think would help them through their college stress. Students agreed that it is something they grew up loving and the animals have a sense of unconditional love:

"It is the physical contact of having a dog around. It's like when you get a hug and there is a release of endorphins."

"Because a dog will still love you even if you get an F on an exam."

After ending session one, students continued to stay engaged with Rocko in a more direct way. Most stayed an additional 5 minutes rubbing and "talking" to the subject animal. However, a group of 3 females stayed an additional 15 minutes just to interact with Rocko on a more personal level. As every student left, they each said "goodbye" out loud to Rocko as if he was a new friend.

Session two had a total of 5 students, 3 female and 2 male. It took place right after spring break when a lot of the students had just gone home to see their families and pets. Out of all three sessions, this session had the most emotionally unstable students. 3 out of the 5 identified as having anxiety and depression from being away from home and other life events. These 3 ended up being Rocko's "favorites" and would spend the most time near them as if he knew they needed to be comforted. The body language of those 3 was very withdrawn at first towards me, but not at all to Rocko. As soon as they saw Rocko, their faces lit up and they started to open up more. As Rocko made his way around the room, all eyes were on him in hopes he would pick them next to get attention from him. As we began our discussion, the students were very open and did not

hold much back. It was as if the presence of the animal being in the room with them made them feel comfortable enough to open up to me. This is a significant finding and could lead possibly to a new form of counseling at UW-Stout. The 2 students who did not identify as having anxiety and depression had little to say and just were interested in interacting with Rocko because they missed their family pets. When asked how the transition has been, students identified it as being difficult and almost as if it was like entering a new world. One of the females indicated she had transferred to Stout and it had been more difficult to adjust here than at her first school.

"See my first year in the community college dorms- actually apartments- weren't too bad because, I knew a lot of people there and it was a separate apartment. But when I came here, I was really anxious. I was nervous because it is a bigger area with more people. I am not very good around people, and I tend to feel very socially awkward. I deal with depression and it has been really difficult. And here I can't have my pets. And the old place I at least had my rats, which was some form of companionship, but here I don't have that. It's difficult, especially not getting to see them very often. The most I hear about my pets is when my mom takes care of kittens and I can hear them meowing in the background on the phone."

A male who identified as having anxiety and depression also said the transition was hard, even though he had made friends and started to form a new support system.

"The first few weeks, even if I was having fun with my dorm floor [friends], I just always had in the back of my mind that I can't go home and I have to sleep in this foreign bed and place I am not comfortable in."

This response suggests the student was experiencing difficulties when he first arrived on campus. He informed me he was looking for some type of relief other than his new friends. He wanted to have a form of familiarity that would be there to unconditional except him and serve as companion. I then moved on to asking them if having pet therapy would help them with their homesickness, especially in the beginning of their first semester. Everyone completely agreed and one female even suggested having a "dorm dog" that could sit at the front desk throughout the week so students could come see it as they please. As the session began to end, the students once again had a hard time leaving. They all genuinely looked sad as they petted Rocko for the final time before exiting. Students stayed an additional 8 minutes after the session ended and once

again everyone said "goodbye" to Rocko.

The final session took place a day after and had a total of 3 students, all female. The students in this session mostly identified as having high stress levels in relation to their academic studies. All 3 have pet dogs at home and were very interactive with Rocko. Since this was Rocko's third session, he started to understand what he was supposed to do. He was the most comfortable with this group and he exhibited a strong connection with one of the students by lying on her feet for approximately 5 minutes. The female was so happy to have his full attention that she would not stop petting him and even massaged him with her feet. When asked about the transition from home to college, the students all agreed that was not the stressful issue; the transition from high school to college was harder. Nevertheless, the females have been able to cope with the transition with the other people on their dorm floors whom they have befriended. I then moved on to the bigger question and asked the females what they thought about pet therapy on the UW-Stout campus. All of them agreed it would be a great addition, and they thought it would be used by a large number of people.

"You can't not smile when [dogs] want to be near you and it would be a wonderful addition to campus."

As I wrapped up our session, the females gave me insight about where the university could house pet therapy. One suggested that it would be most beneficial to have it in a room in the library because that is where students go when they have the most critical assignments to do.

Overall, the focus group sessions had a significant role in my research and I was able to gain the most feedback from the students who could attend the sessions. The students input gave me better insight and perspective on what they are going through during their first couple years of college. I was able to conclude that, overall, pet therapy would appeal to a variety of students for diverse reasons including a form of comfort, companionship, and as an aid to help with homesickness, stress, anxiety, and/or depression.

DISCUSSION AND CONCLUSION

My research demonstrated many significant aspects of the human-animal relationship amongst college students and the desire for companion animals. I learned there is a wide range of students interested in pet therapy at UW-Stout for a variety of reasons. Some students are looking for the comfort animals offer on a more basic level of companionship. Others are

seeking the attention to help them cope with greater issues such as stress, homesickness, anxiety, and/or depression. Whatever the motive may be for seeking the interaction with animals for the students, they all agree that the University of Wisconsin-Stout should take the step to become more animal-friendly by having pet therapy offered to its students on a regular basis.

The concept of having a "dorm dog" could also be a great benefit to the students living on campus. If UW-Stout were to have a companion dog come to the dorms once a week for a certain number of hours in an assigned area such as the main entrance, students could come see the dog as they wish, giving them that extra boost of comfort and relief. Having the dog at an assigned area will allow for those students who wish not to engage with the dog a chance to use a different entrance, therefore avoiding contact if desired. The dogs used for this could be dogs that are pet therapy-certified, which means that they need to maintain a certain number of field work hours per month to keep up with their certification. For example, of emBark, a dog obedience school in Eau Claire, is interested in bringing pet therapy dogs to serve as "dorm dogs" on the UW-Stout campus.

Another idea proposed by the students is to have a room in the library dedicated to pet interaction. This idea could work if the companion animal was there a set few hours a week, allowing for the dog to not be trapped in a room all day. Students once again could come and go as they please throughout the available hours, and they do not have to participate if they so choose.

Further Inquiry

There is still more to be done on the UW-Stout campus in order to make pet therapy sessions offered on a regular basis. However, starting in the fall of 2014, students who can provide the correct paper work indicating that they have a mental disability and need a companion animal for emotional support, will be allowed to have them live in the dorms with them. After meeting with UW-Stout housing staff members, I also learned they are very accepting of the idea of having pet therapy available for students on campus, but they do not have anyone to advocate for the policy to allow animals in the campus buildings being most buildings do not allow animals currently. I also learned the campus will have to do further investigation on what types of animals and/or breeds of dogs to use since not all animals are cut out to be companion animals (Ley and Bennett, 2007). There still needs to be more input from students and more focus groups to get the most effective data. The sessions also should aim to get a higher male population to attend since most of the participants for this

study were females. I also would like to do a similar study to this research, but with those that do live off campus and have the opportunity to or already own a pet. My findings suggest that if colleges and universities continue to expand these programs, they will be likely to improve outcomes for students by reducing stress and anxiety, homesickness, and depression. Not only would this benefit students, but it could potentially directly benefit the university by increasing retention and graduation rates among students.

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Contingency Valuation and Interviews in Open-Source Software Market: Utilizing Conjoint Methodology in Economics

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ABSTRACT

This research investigated a possible anomaly in the computer software market where seemingly irrational purchase preferences of closed-source software with an above zero price were compared to open-source software with a zero purchase cost product. Classical theory would predict consumers, when comparing two identical goods, would prefer a lower price to a higher market price. The marketplace for computer software is changing as quickly as the personal computing market. One way to determine the value of a zero purchasing cost good is to utilize the Contingent Valuation Method (CVM). This research set out to determine whether introducing interview research could lessen the bias of small sample sizes in CVM. The methodology prepared in this paper encompasses risk aversion, consumer knowledge, and demand schedules for zero-priced goods. This research evaluates if the source code's transparency affected market demand for statistical regression software used by academic economists in Wisconsin to determine the effectiveness of the methodology developed within this research.

Keywords: open-source software, small sample sizes, data limitations, contingent valuation, mixed-methods economic research, conjoint methodology .

INTRODUCTION

Contingent Valuation Method is an econometric tool used typically to estimate the value of environmental and ecosystem products or services. It is considered a "stated preference" method because the survey asks the respondent directly to state the value of the product or service. Contingent Valuation is primarily used in environmental economics due to the lack of an explicit value. This powerful tool can discover the value of an acre of trees or whether certain environmental, governmental policies are realistic to the market. It can also assign values to non-use values. A hypothetical example of this would be "What tax would you pay to stop deforestation in Billings, Montana?" This type of question asks not what they would pay for deforestation, but what they would pay to avoid it.

The statistical computer software market might seem a far cry from

environmental policy, but CVM can provide discrete values for the price of "free" computer software. The challenge utilizing CVM is the substantial sample size required to obtain statistically significant results. This research focuses primarily on the statistical software market for academic economists within Wisconsin. Using a niche population reduces the sample size, therefore reducing some of the sample size requirements. The interview research was aimed at both an experiment of methodology and a focus on how much weight to assign each variable within the *a priori* hypothesis. This methodology reduces the high sample size burden required in traditional CVM.

This research is vital to understanding this market for software firms specifically because if their competitors are offering comparable products for at zero costs it will reduce their revenues. Software commons are creating software and changing consumer purchasing habits online, controlling a market share of greater than 60% of web browsers, 90% of mobile operating system, and 66% of all servers use open-source (Brisco 2013, Glass 2004). Software development is a field in which companies create value through bundling and organizing information using a language of computer source code. (Brynjolfsson 2000). These products should be difficult to produce because each user is uploading a variant of their coding experience and style without any formal credential requirements needed in the traditional model. CVM is a powerful econometric tool that is underutilized due to less restrictive and costly alternatives, especially at the undergraduate level where funding is limited for research projects. In many cases, using this methodology would reduce the time and survey costs.

Literature Review

Firms seem to use this software without investing into its development. A characteristic of market failure is when consumers (in this case a firm is a product user) receive an external benefit without incurring the cost of the benefit. The software developers are producing marketable products collaboratively online for no explicit monetary return. They are contributing in small or large fashions in an extremely decentralized structure with explicit monetary return. Commons-based peer production is a production model in which the creative energy of a vast number of people is coordinated to produce meaningful projects (Hess 2007, Bitzer 2005).

Producer theory states that market prices are determined by the actions of individual agents (consumers). A competitive market has the following four characteristics: a large number of buyers and sellers, unrestricted mobility of resources, homogenous production, and information symmetry. Private firms continue to increase as relatively fixed size markets look to

expand revenues. Successful manufacturing companies have been affected by a relatively small number of factors. They include the following: total number of competing suppliers (firms producing similar product), market price, production conditions (state of technological advancement), macroeconomic policies and regulations, price of inputs, and the production firm's break-even price of the good. These fundamental microeconomic principles are the constraints on behavior that allow economists to predict how changes in the market will determine future behavior by actors involved. Private goods function within behavior constraints to reach an optimal outcome. Pareto optimality (or efficiency) is a state of resource allocation in which it is impossible to make any one person better off without making at least one person worse off. Pareto optimality is a change in the distribution of resources that makes at least one person better off without making another worse off. Economic signaling theory is one party conveying information about oneself to another party to solve a problem of information asymmetry. Information asymmetry is a problem that can occur with software if online reviews are unreliable or if purchases are final at the point of transaction. Even with capable software, it may not fit the user's desired preferences such as intuitive user interface or specific table or graph requirements.

A product with a higher sticker price might achieve a greater perception of quality because market players may be less willing to learn "free" software compared to $0 < X$ priced software. It is a question of how one values his or her time constraints and learning cost. Programmers developing software for an open-source project are receiving utility (happiness) from working on software. They also are improving their total marketable skill sets by solving bugs that may be difficult, publically releasing their work online for others to analyze (including employers), and increasing their field experience. They are using a software project as a signaling mechanism for their skillset (Inderst 2001). A signaling incentive becomes larger as a project becomes more visible, more difficult (effect effort has on the impact), and more informative to their skill set or talent (Holmström 1999).

This research seeks to analyze whether consumers of open-source software may be using price as a signaling mechanism. Research has shown a correlation between using price information when other signaling cues on quality are absent. Consumers must see an alternative of lower cost as significantly lower quality. According to Grewal (1985), there is a weak correlation between price and brand name. Consumers gather perceptions of quality when both positive price and brand name are present. Consumers evaluate price and quality in divergent ways depending on their value of each component. Zeithaml (1989) used focus groups and interviews to establish how

sticker price impacts consumer's perceptions of quality and value. Price may be a signaling mechanism of quality. A product with a higher sticker price might achieve a greater perception of quality because market players may be less willing to learn "free" software compared to $0 < X$ priced software. As price rises, consumers risk-seeking behavior decreases (Shehata 1992). At the high end, statistical software may have a greater perception of quality because it is viewed as less risky. In this way, consumers may see "free" and regard it as inferior quality or inherently more "risky" (Lerner 2002). Another potential problem is how one value is their time constraints in learning cost. Little research has been done on open-source software utilizing interviews or willingness-to-pay (WTP) models. Raghu (2008) investigated online piracy and what, if any, impact open-source goods would cause to proprietary source software. The issue with comparing Microsoft Office to Open Office (OPOF) is that OPOF is a substitute good that functions like Microsoft Office but is free to use, share, edit, and publish. In this way, it is marketed as an inferior product. Software suites like R or SOFA could not be described as inferior goods even though they are zero-priced.

Interview Methods and Results

The interviewees presented a strong link between their occupation and extensive knowledge of the market product. The following were the key ideas this research aimed to contribute towards: Current Software Choice (Effort Justification (EJ), Signaling Theory (ST), Prospective Software Choice (ST), Knowledge of Open Source (EJ,ST), and Involvement in Open Source Projects (EJ,ST). Interview research was based upon a detailed guide with flexible structure to the four principal question categories above. The interviews were conducted on two major college campuses. Participant recruitment was primarily gained through the email interview requests. The three interviews conducted took an average of 23 minutes with a total range of 17 to 28 minutes. All participants were given an entirely arbitrary lettering code. A recording device, signed consent form, and jotting notebook were all used in the face-to-face interviews. The use of jotting and eventual transcription allowed the presence of the interviewer as well as the specific information to be captured. The interviews focused primarily on Statistical Analysis Software (SAS). All of the interview participants were male. Participation was entirely voluntary, and subjects were informed before signing the consent form of their right to withdraw at any time and/or refuse to answer any questions. The first step was to define the relevant nomothetic coding categories. The first category was to define and code the product features emerging from the interview. The second category was the emergent data on open-source, price,

and product changes. The strongest characteristics that appeared were past use of software and regression analysis. These two features were discussed at length in all three interviews, which are indicative of their importance to this market. A finding that was unanticipated in the preliminary stage of this study is the impact that previous software experience in graduate school has on the software they currently use in their research. One participant noted that he had not purchased any new software since graduate school. In this case, he was still using Stata 6, which is somewhat shocking because Stata has major releases every two years with minor updates occurring annually. With each major update, their software is discounted to those who purchased the older version. Stata 6 was released in 2006, which means they have had three major releases and four minor updates since this participant last purchased software. This type of analysis was also important to all three participants and was primarily dependent on their research interests. Support, stability, and updates were also important to two of the participants. One participant has used the open-source product *R* but does not currently use it because of the extensive coding experience required to use the software. The participants showed a positive outlook on the open-source software market's total quality, flexibility, and potential. One had contributed to the open source project previously but did not anticipate any future involvement. The most common piece of open-source software being used is *R*, as all three participants noted some experience with it. The most common software being used is SPSS because the university provides it to their students. Price has an impact, especially considering the case of Interview T. Future interviews may show a consistent pattern of a single purchase providing adequate utility.

Survey Methods and Data:

The initial survey deployment has been limited due to small sample size. The graph below displays the design of Contingent Analysis using Discrete Willingness-To-Pay. All values have a minimum of \$0 and a maximum of \$1000. A limited selection bias is not an issue because values within single user market research have shown extremely limited markets beyond even the \$700 mark. The data currently is far too limited to make any conclusions regarding the statistical significance and/or reliability of models.

The research *a priori* expectations are listed in Table 1. Establishing expectations without considering the data sample is a fundamental tool when working with a limited data set. The specific correlation trends are proceeding from the qualitative interview research conducted in late 2013. This information, coupled with economic literature, provides a clear anticipation of how we can expect this market to function. The interview research was

aimed at both an experiment in methodology and a focus into how weight establishes the *a priori* hypothesis.

The current hypothesis states that
 $WTPD = \beta_0 + \beta_1(INC) + \beta_2(AGE) + \beta_3(W_0 - W_1) + \beta_4(GEN) + \beta_5(Q15X/5) - \beta_6(RSKAVER) + \varepsilon$ where β_0 =Constant, β_1 - β_6 =Coefficient terms, ε =Error term

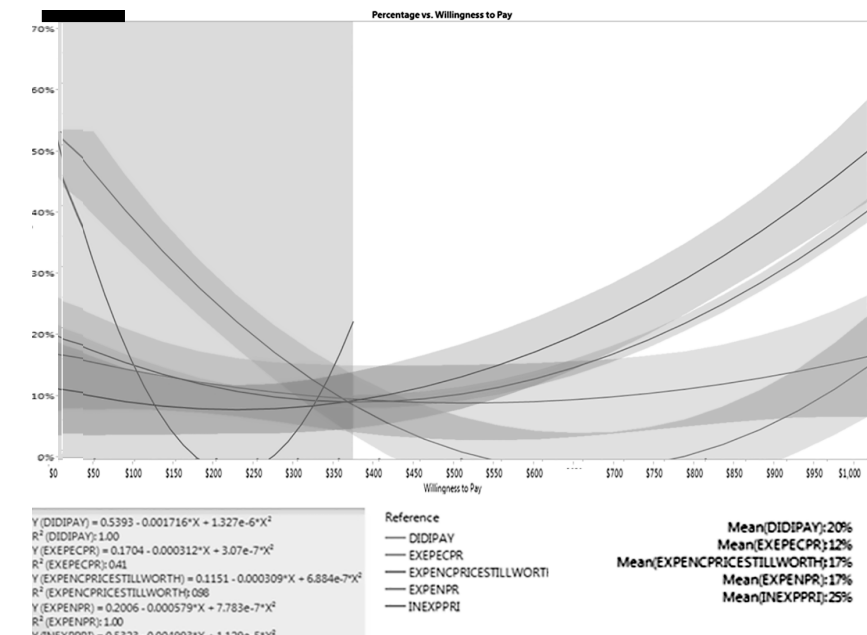
<u>Aspect of Model (<i>a priori</i>)</u>	<u>Anticipated behavior function</u>
Intercept(β_0)	Unknown. Anticipate relation to WTP_{Ref}
Income (β_1)	The higher one's household income the greater the likelihood that they are less sensitive to price fluctuations. Measuring mean demand elasticity will provide coefficient.
Age (β_2)	Anticipate the higher one's age the greater likelihood that they are less demanding of \$0 software because of learning costs.
WTP Choices ($\beta_3(W_0 - W_1)$)	Price elasticity will decrease substantially from \$0 to $\$>0$ and eventually stabilizing onto an equilibrium then shifting to become relatively more inelastic.
Gender(β_4)	None.
Reported expertise(β_5)	The stronger reported expertise in statistical modeling will increase demand for specialized software (script and command based). Higher prevalence of \$0 price expectations.
Risk Aversion Coefficient(β_6)	Anticipate higher correlation coefficient reducing demand for \$0 goods (Negative Correlation) $\sqrt{\sigma}$
ε (Error term)	Anticipating a high error term to occur in this dataset because $N < 46$

TABLE 1
Discrete WTP Choices

The graph above illustrates that the sample's total demand for statistical analysis software using open-source code has a price of $p_{os} \leq 0$. Statistical analysis software using proprietary source code has a rate of $p_{ps} > 0$. A total of five limited-bound open-ended questions were asked in the survey. Exhibit 1 below is an example of one of the five questions posed in the survey. This data point is used to calculate a consumer's reference price.

Please state the price you would expect to pay for statistical analysis software? (Minimum of 0, Maximum of \$1,000)

Copy of Question Format



The table below contains the descriptive statistics for the Willingness-to-Pay questions.

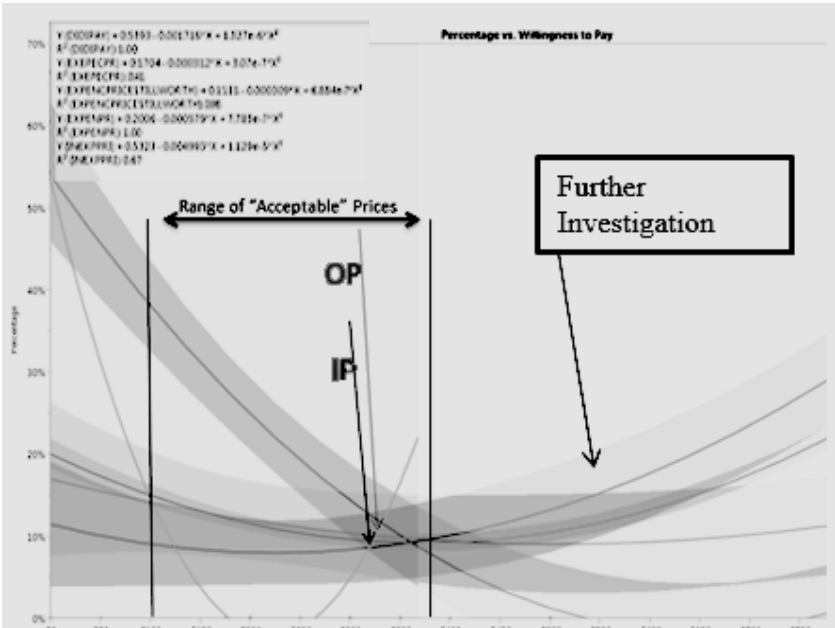
Descriptive Statistics						
Question Asked	N	Range	Minimum	Maximum	Mean	σ
Approximately how much did you pay for your current statistical analysis software? (Minimum of 0, Maximum of \$1,000)	9	\$1,000	\$0	\$1,000	\$227.78	\$336.444
At what price would you consider statistical analysis software to be so inexpensive that you would have some doubts about the product quality? (Minimum of 0, Maximum of \$1,000)	9	\$350	\$0	\$350	\$72.22	\$132.550
At what price would you consider statistical analysis software to be expensive but still worth buying because of product quality? (Minimum of 0, Maximum of \$1,000)	9	\$1,000	\$0	\$1,000	\$594.44	\$406.544
At what price would you consider statistical analysis software to be so expensive that it would not be worth purchasing regardless of product quality? (Minimum of 0, Maximum of \$1,000)	9	\$1,000	\$0	\$1,000	\$677.89	\$403.144
Please state the price you would expect to pay for statistical analysis software? (Minimum of 0, Maximum of \$1,000)	9	\$1,000	\$0	\$1,000	\$286.11	\$322.856
Valid N (listwise)	9					

A priori expectations proceed from known causes within other research, academic knowledge, and completely independent of observations. They provide a base set of economic logic and reasoning to be analyzed against the sample data.

Descriptive Statistics

The range of acceptable prices is the optimal price for firms to set their price. The difference between the optimal price and indifference price establishes consumer's price-stress (Hofstetter 2009). Consumer price stress is a tool we can use to see how price-conscious consumers are. This tool has historically been utilized by firms that receive a majority of their revenue from inexpensive, high volume, and low mark-up items.

The price sensitivity, in this case, is slight. *A priori* expectations were that statistical analysis software would be homogeneous and for this reason, exhibit a much larger price stress. Price stress is analogous to price elasticity. The demand function near the end of this graph needs further exploration. At the high-end stated prices rise, which seems to defy what we know about the law of demand. The results collected back from the single round of surveys appeared to have been impaired by this bias since out of the 56 University of Wisconsin professors, only 20 completed with viable data. The dataset given required further research and gained no conclusive results from this experiment.



WTP with Optimal, Indifference, Stress, and Acceptable Price Range.

CONCLUSION

The market for statistical software provides economics with the unique challenge of adapting long-standing theoretical models to some of the new challenges that information goods have presented in the digital age. Open-source software production utilizes rational software developers producing sections of code. They do this with no present benefit other than peer acknowledgment (ego-satisfaction) and gain in utility. Professional and academic economists who use statistical software seem to use price as a signaling mechanism of quality. For goods with no price, their perceptions about the quality would be negative. They are behaving rationally but may be overvaluing software that has a >0 price. The value in this research is the mixed-methods research design increasing the likelihood of accurate questions in the initial survey round. Willingness-to-Pay models have not evaluated open-source goods on the scale they merit. The growth of technology companies, increase in open-source implementation, and potential market failure are all the main reasons further research should be investigated. The lack of valuable data found in this market may create a concern that the inherent structure of the methodology may be flawed. The data constructs mean very little inside of the testing group. It is the wide-ranging appeal to utilize mixed-methodology when data collection feasibility is low.

Researchers will need to be careful to not introduce this bias as it can cause an increase in the anchoring effect (Boyle, 1979). It does encourage a survey taker to think about the question far more. While increasing reliability, it also increases survey dropout rate. Investigators must review requests to be sent out over an extended period (12-18 months), comprising a large number of respondents (200 to 300). It also should involve a greater geographical scope than this research utilized. The overall process of using discrete choices, risk aversion, and factor analysis could provide intriguing statistics on this type of market. This theory of collaborative networks would have had a much larger impact on this paper's final results if the interview transcripts were applicable to contributors involved in this system. Future research into how it is best suitable to use transparent, ethically-based, and collective distribution systems in a profit-seeking environment should be conducted.

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Credit and Debt Management Among UW-Stout Students: Practices and Implications

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ABSTRACT

For many Americans today, debt has become a part of life; this is especially true for college students because of the rising costs of higher education. Student loan debt was held by 70% of 2012 graduates according to Reed and Cochrane (2013), averaging \$29,400 worth of debt per graduate. But student loan debt isn't the only form of debt that graduates hold; credit card debt is also growing. The average undergraduate credit card balance according to the 2009 Sallie Mae study was \$3,171. With student loans, credit cards, and other loans, students are graduating with more debt than ever before. The cause of this problem is twofold; higher education costs are rising, but students are also engaging in poor credit management practices. These practices are worrisome because they impact the entire economy's health. Korkki (2014) cited a Federal Reserve Bank study indicating that since the recession, overall homeownership among 30-year-olds has decreased, but most significantly among those with student loan debt history. Not only did Korkki report that the high debt levels impact the housing market, but there appears to be a negative correlation between small business startups and student loan debt. In this study conducted among students at the UW-Stout, we analyzed current credit and debt management practices among students, as well as their understanding of basic credit terms and applications. Compared to national studies, students at UW-Stout don't engage in as risky of credit practices, but still lack the fundamental knowledge to engage in wise credit practices.

Keywords: credit card, loans, student debt

Credit and Debt Management Among UW-Stout Students

INTRODUCTION

The financial market today is larger and more complex than ever before. The plethora of new investment opportunities and financing options available to the average American has made access easier and potential rewards greater. It has become easier for the average American to set up various savings tools or invest and manage stocks and mutual funds online. More young adults have access to credit to pay for education, help make ends meet between paydays, and make major life purchases such as a home. The growing financial market has helped individuals take control of their finances, achieve their dreams, and benefit from their investments; however, these opportunities come with a price: the possibility of devastating monetary losses.

The 2008 Financial Crisis, housing market bubble, and subprime mortgage crisis have brought a lot of attention to financial illiteracy in the United States. Many Americans lack the financial knowledge to make informed choices when it comes to money management, properly evaluating insurance needs, and investment risk and returns (Bongini, Trivellato, & Zenga, 2012). Yet, although individuals may not be able to make informed decisions, that doesn't mean that these routine decisions won't be made. Lussardi and Mitchell (2011) found that only half of respondents in their study were able to answer a question about market risk diversification correctly. Although people now have the opportunity to easily control their own investments in the market, if only half know the risk associated with stocks versus mutual funds it is unlikely that they are making wise investment decisions. This is also true when it comes to credit and debt decisions. Recently, Chen (2014) reported that the average household holds \$15,252 in credit card debt and \$32,986 in student loan debt on top of \$152,209 in mortgage debt. So although a growing financial market may seem like a positive thing, it has created a society with overwhelming debt and the inability to properly save for major life events.

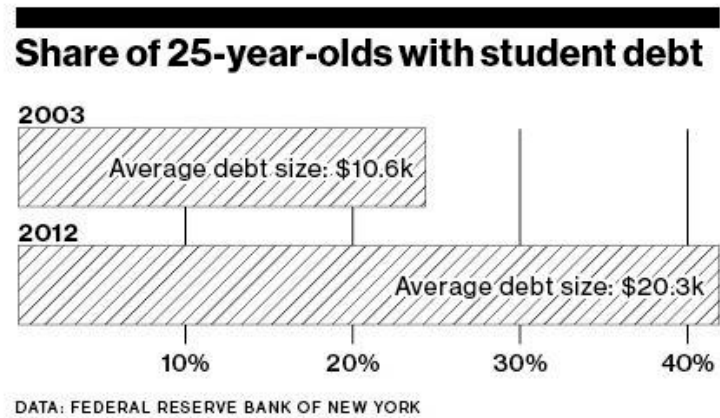
When it comes to making uninformed financial decisions, one group that is at particular risk is college students, as they are faced with decisions that will financially impact the rest of their lives. College is the first time for most students that their expenses exceed income, they find themselves accumulating debt, and they have access to credit cards. Without a strong understanding of debt, credit, and money management, students may be misusing their credit. Holding more debt and longer may hinder the student's ability to secure future loans for a home, car, or small business as well as postpone saving for retirement and other major purchases. Given the long-term effects of poor credit decisions made during college, this research aims to identify some of the common credit management practices among students at the University of Wisconsin-Stout regarding credit cards and loans as well as how much they know regarding credit scores and reports.

Literature Review

The majority of college graduates are considered financially literate, or able to score at least 60% on a financial literacy exam, but unfortunately only 34% of Americans graduate from college. This leaves a large portion of the population financially illiterate. When Mandell (2008) tested the financial literacy of high school students, he found that students intending to pursue a four-year degree performed 34.9% better than the rest. Based on this difference, we assume that college students are some of the more financially literate individuals. Yet students today are graduating with more debt than ever before. One of the most common sources of debt is the increase in student loans due to the rising cost of higher education. The U.S. Department of Education (2013) found that the cost of education has risen from \$8,438 in 1981 to \$19,339 in 2011 using constant 2011-12 dollars. This is a considerable leap, leaving many students unable to pay for higher education without incurring some form of debt. This means that the number of student loans

being issued and the average balance of graduating seniors has grown in recent years. In order to better illustrate this increase, Louis (2013) used Federal Reserve data to compare the average student loan debt among 25-year-olds in 2003 and 2012. She found that in nine years, the average student debt almost doubled, as displayed in Figure 1. While the rising cost of education has contributed to the total debt held by college students, it is not the only source.

FIGURE 1



Students also accumulate debt through mortgages, car loans, and various other sources; however, another area that has also experienced rapid growth in recent years is credit card debt. In Figure 2, Sallie Mae compared the median debt among college students and found that students are holding considerably more debt at every grade level (2009).

FIGURE 2

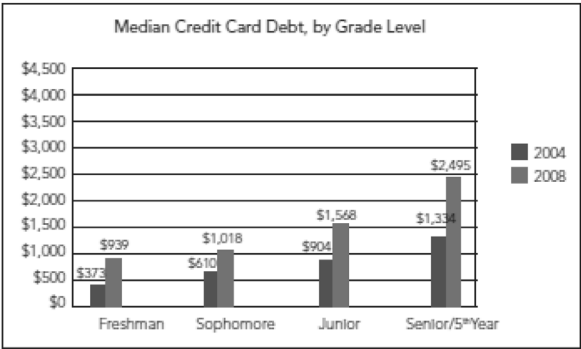


Figure 2: Increase in the median credit card debt among college students by grade level from 2004 to 2008.
Source: Sallie Mae, 2009

Not only is the median debt increasing, but students are also beginning to use credit cards earlier. Jones (2005) suggests that 62% of students have access to credit cards before arriving on campus, which is consistent with the Sallie Mae (2009) study finding an almost 70% increase in college freshmen with credit cards. This means that young adults are faced with decisions on how, when and why they are going to use their credit cards—decisions that will have a lasting effect on their credit history and overall personal finances. Unfortunately, oftentimes these young adults lack effective credit management skills. This is becoming clear by the number of students obtaining more cards and incurring more debt earlier. Sallie Mae (2009) found that the number of freshmen with zero balances decreased by 53% between 2004 and 2008 and the median credit card debt among college freshmen nearly tripled during those four years from \$373 to \$939 shown in Figure 2. This large increase in the median debt held by college freshmen is worrisome; however, how worrisome depends on why the increase happened.

For most college students, holding a full-time job while attending school is very difficult if not impossible. Without the ability to work full time, many students are forced to rely on alternative means to make ends meet. Credit cards can help students purchase necessary goods and services before payday. Although it is now more difficult for college students to obtain credit cards because of stricter lending regulations, credit card debt is still a problem on campuses. The problem begins when students use credit to live beyond their means, accumulating debts aren't paid off, and students fail to recognize the different costs associated with borrowing money from credit card companies. Unfortunately, many individuals under the age of 35 believe it is all right to borrow money for living expenses (Castellani and Devaney, 2001). On top of that, Sallie Mae (2009) found that 40% of respondents admitted to having charged items knowing that they didn't have the money to pay the bill. This is a red flag for risky credit card behavior, but it doesn't stop there.

White (2012) cites research suggesting that risky credit behavior arises from a lack of fundamental credit card knowledge, including basic credit terms and applications. Sallie Mae (2009) found that 82% of credit card holders carried balances month to month and incurred finance charges. Not only are students incurring these charges, but they have no idea what these charges are. Ludlum (et. al, 2012) looked at students' knowledge of late fee payments, overbalance fees, and interest rates and found that the majority of students were unable to answer these questions on credit cards they were currently using, registering incorrect response rates of 75.7%, 70.8%, and 85.4% respectively. Many college students don't understand the difference they will be repaying by making minimum payments compared to paying the balance off in full or by missing payments altogether. If almost three-fourths of students don't understand credit card fees associated with poor credit decisions, the fees aren't acting as a deterrent from engaging in those types of risky behaviors that can lead to overwhelming debt that will take years to fully pay off and will have a negative effect on their credit history. Although students may not know what purchases they should put on their cards or the

fees associated with late or missed payments, they do know information that impacts how they use their cards. Warwick and Mansfield (2000) found that students know their balance and credit limit. It appears that students know the basic concepts associated with credit cards when it has a direct impact on their behavior, like how much they can spend or have spent, but aren't aware of much else.

There is a large gap between the knowledge necessary to make wise credit decisions and the current level of credit literacy among students. This, however, varies across several demographics including gender, age, and parental influence. Men and women have different credit card behaviors. Limbu, Huhmann, and Xu (2012) found that when it came to efficiently managing monthly outstanding balances, women outperformed men. This is contrary to findings where women were less likely to pay off their cards and more likely to make only the minimum monthly payment (Robb, 2011). While gender differences are highly debated when it comes to credit card use, age appears to have a more decisive influence. Limbu, Huhmann, and Xu (2012) looked at the differences between older women and younger female college students, finding that female college students may be more vulnerable than their older counterparts because they lack confidence in their credit card management skills. Age also appears to have an effect while students are in college. Hancock, Jorgensen, and Swanson (2012) found that juniors and seniors were 2.4 times more likely to have over \$500 in debt and almost four times more likely to have two or more cards compared to freshmen and sophomores. Since parents influence the skills, knowledge, and attitudes held by young adults about consumerism, it is possible that parental influence and involvement may have a significant impact on students' credit card behaviors. Palmer, Pinto, and Parente (2001) found that parents' involvement before credit acquisition leads to having a lower credit card balance. This supports the idea that if students are taught about credit management before getting their first card, they will have a better understanding of credit and how to use it effectively, an idea further supported by Limbu, Huhmann, and Xu (2012), who found that there was an inverse relationship between parental involvement and credit card use and materialism, meaning that higher parental involvement leads to more responsible credit card balance management. Palmer, Pinto, and Parente (2001) also looked at effects of post-acquisition parental involvement and found that this actually leads to an increase in the total outstanding balance. This could happen because post-acquisition involvement most often takes the form of financial support, teaching the student nothing about effective credit management. It appears that a lot of different factors can influence a student's knowledge about credit, including gender, age, and parental involvement. Even though all of these factors play a role in shaping credit knowledge and practices, the problem still remains that credit card debt is a large problem on campuses because students lack an understanding of self-beneficial credit card behaviors and the consequences of poor credit choices.

DATA & METHODOLOGY

Participants

The survey was distributed to students enrolled at the University of Wisconsin-Stout during the Spring 2014 semester. The link was set to a randomly generated list of participants on their school-issued email provided by UW-Stout's Planning, Assessment, Research and Quality office. Of the 1500 students that the link was sent to, 144 opened the link.

Questionnaire

The questionnaire consisted of questions regarding the participants' demographics, family influences, and experience as well as basic credit knowledge. Participants were asked about their experiences with credit cards, loans, and employment. The basic credit knowledge questions were derived from a variety of different sources commonly used to measure financial and/or credit literacy: Credit Score Quiz, Credit Check Total, and the Jump\$tart National Coalition for Personal Literacy survey. The credit knowledge questions were about credit scores and reports. These two topics were selected to serve as a basis to determine how much participants understand about credit and its practical uses in everyday life.

METHODOLOGY

In order to interpret the data set collected, it was arranged a number of ways. First, it was coded and cleaned to eliminate responses that didn't answer any of the key questions, loan, and credit card experience. This trimmed the data set down to 139 responses. This was the data set used to examine trends between loan use and credit card behaviors. The next step was to clean the data set again to eliminate any responses that didn't answer the four key credit knowledge questions. This left a data set of 115 usable responses

RESULTS

Credit card use is present on campus, although UW-Stout is below the national average. According to Sallie Mae (2009), 84% of undergraduates have at least one card while only 58% of UW-Stout students have at least one card. However, these percentages vary greatly by grade level, as shown in Chart 1. While the majority of freshmen have no cards, the majority of seniors have two or more cards.

CHART 1

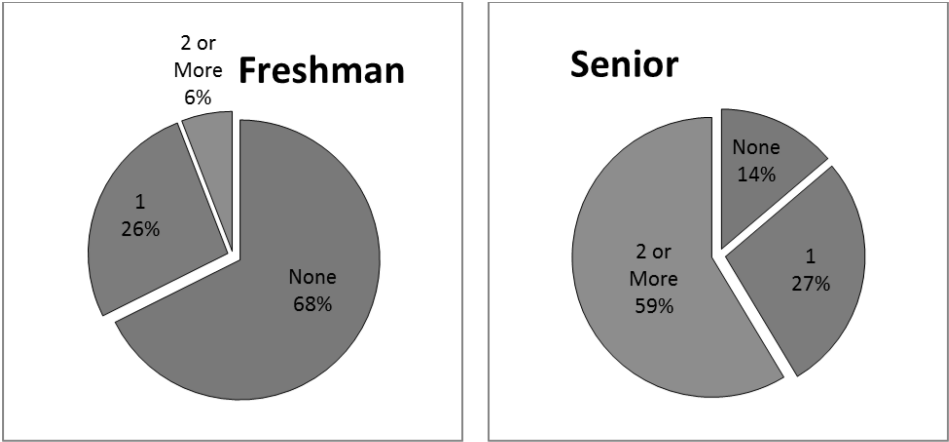


Chart 1: Differences in Credit Card Usage Between Freshman and Seniors Based on Number of Cards Held.

Seniors not only have more cards than freshmen, but they also carry more debt as shown in Chart 2. Since seniors have three more years to accumulate student loan and credit card debt than freshmen, these results are predictable. Many seniors may have also taken out their first car loans or maybe even a mortgage. The majority of seniors hold over \$20,000 in total debt, while no freshmen hold over \$10,000 in total debt.

CHART 2



Chart 2: Total Debt Held by Freshmen Compared to Seniors.

Although a variety of demographic and experience-related factors influence credit card behaviors, there is a tendency for students to enter into a “double jeopardy” type situation. Pinto and Mansfield (2006) found that higher outstanding credit card balances were associated with higher student loan debt. This is also true of students at UW-Stout. Chart 3 illustrates the tendency of students who have taken out more loans to also have more cards.

CHART 3

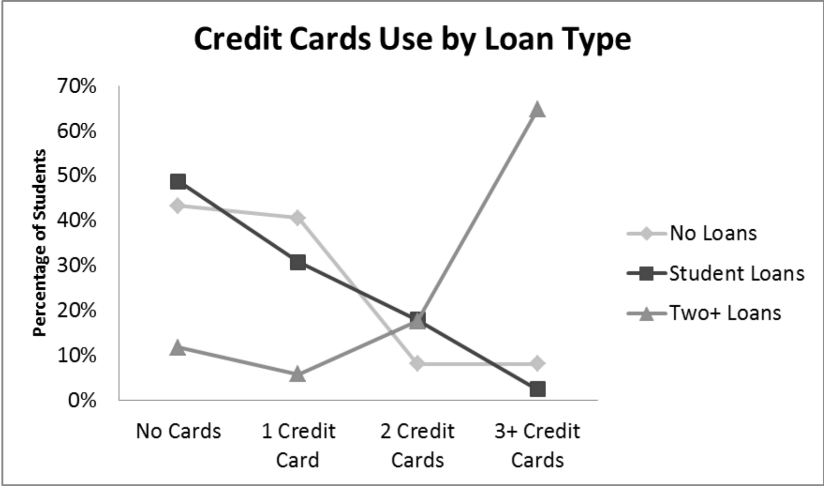


Chart 3: Percentage of Students Holding a Specific Number of Credit Cards Broken Down by Types of Loans Held

What is interesting is that students that have only taken out student loans and those that have no loans at all hold approximately the same number of cards at each given level. This could be occurring because students with student loans haven't had to start repaying them yet, making their experiences with credit very similar to students that haven't taken out any loans. A similar effect happens when looking at the percent of students with a specific credit card balance broken down by types of loans, as in Table 1. Just as the majority of students with no cards either hold no loans or only student loans, they are also more likely to have a credit card balance under \$1,000. Students that have two or more loans are the only students that reported having a credit card balance over \$10,000. In terms of double jeopardy, students with a greater number of loans tend to have more credit cards, just as those with more credit cards tend to have higher credit card balances, so overall, students with more loans tend to have more cards and higher balances.

Table 1: Breakdown of Credit Card Use, Credit Card Balances, and Types of Loans								
		Number of Credit Cards				Credit Card Balances		
		No Cards	One Card	2 Cards	3+ Cards	Under \$1,000	\$1,000-\$9,999	More than \$10,000
Loan Types	No Loans	43%	41%	8%	8%	85%	8%	0%
	Student Loans	49%	31%	18%	3%	83%	9%	0%
	Two+ Loans	12%	6%	18%	65%	43%	29%	29%
		-	-	-	-	-	-	-
Credit Card Balances	Under \$1,000	0%	61%	26%	4%	-	-	-
	\$1,000-\$9,999	0%	27%	40%	43%	-	-	-
	More than \$10,000	0%	0%	25%	75%	-	-	-

In this research, the credit behaviors of students weren't the only thing looked at; credit knowledge was looked at as well. Overall knowledge about basic credit management at UW-Stout is relatively low. Table 2 shows the total percent of students who were able to answer a few of the credit questions correctly. The scores vary greatly by question but the average total score was 53.57%, meaning that the majority of students were barely able to answer half of the questions correctly.

TABLE 2

Table 2: Correct Response Rates Among All Participants	
What Does a Credit Score Measure?	44.64%
When Can You Check Your Credit Report?	75.89%
Who Has Access to Your Credit Report?	58.93%
What are the Three Major Credit Reporting Bureaus?	34.82%
Average	53.57%

The two questions students answered best were “when you can check your credit report” and “who has access to it.” This could be because students have the most experience with these questions. In order to qualify for loans they may have had to check their credit report and as they begin their job or apartment search they may have encountered someone who wished to check their credit. The question that was most difficult for students to answer was identifying the three major credit-reporting bureaus. FICO is not one of the three reporting bureaus, although it is a commonly used term when talking about credit, which may have caused some confusion among students. When results are broken down further, it appears students with two or more loans have an increased experience with credit that helps their overall understanding, as displayed in Table 3.

TABLE 3

Table 3: Correct Response Rates Between Those With Two or More Loans and Those With Only Students Loans or no Loans at all			
	Two or More Loans	Student Loans	No Loans
What Does a Credit Score Measure?	40%	47%	45%
When Can You Check Your Credit Report?	96%	73%	76%
Who Has Access to Your Credit Report?	80%	53%	66%
What are the Three Major Credit Reporting Bureaus?	67%	19%	55%
Average	71%	48%	60.5%

It appears that although students with two or more loans have more debt, on average, their experience helps them better understand credit than the other two. The same is not true for students with student loans. Although

they have more experience than students without loans, their response rates aren't that different. This lends itself to the idea that it is not the amount of experience, but the type of experience that plays a role in shaping credit knowledge. Since students haven't begun repaying student loans and the approval process is fairly simple, having student loans while still in college may not provide any credit experience.

While it is interesting to see how credit experience tends to help credit knowledge, there were also some alarming discoveries. Almost 13% of students believe that their current debt was not manageable, just over 12% of students admitted to using their cards to live above their means, and almost 20% of students admitted to making a purchase knowing they didn't have the money to pay for it. These are examples of risky credit behavior that can lead to long-term negative consequences.

DISCUSSION

Long-term consequences of graduating with a large amount of debt are just coming to light. Many graduates find themselves moving back in with parents to save money. A Federal Reserve Bank study found that home ownership was lower for 30-year-olds with student debt histories (Korkki, 2014), which is consistent with a Consumer Financial Protection Bureau report suggesting that millennials with debt put off homeownership (Malcolm, 2013). Not only are student loan debt holders less likely to own a home, but they are also more likely to hold other debt post-graduation. Richard Fry (2014) looked at how much those with student loans owned on mortgages, cars, and credit cards compared to their counterparts in Figure 3 in two categories: those who graduated from college and those who attended college but didn't graduate or did not attend at all.

FIGURE 3

Student Debtors More Likely to Owe On Cars, Credit Cards

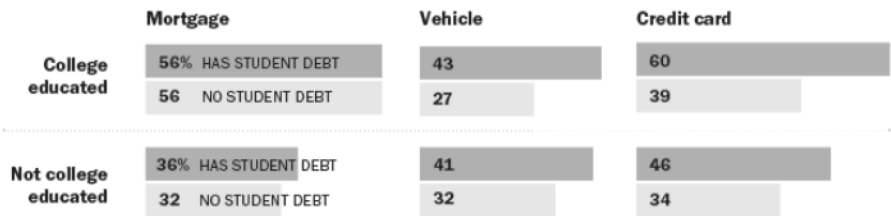


Figure 3: Mortgage, Vehicle, and Credit Card Held Among American Households under 40 by Student Loan Debt Holdings

Source: PEW Research Center (Fry, 2014)

The total indebtedness of those with student loan debt is almost twice as much as those without. This is very similar to the double jeopardy of

college students. Just as students with more loans hold higher credit card balances, graduates with student loan debt hold more total debt. This is evident through Fry’s (2014) debt-to-income ratio analysis in Figure 4.

FIGURE 4

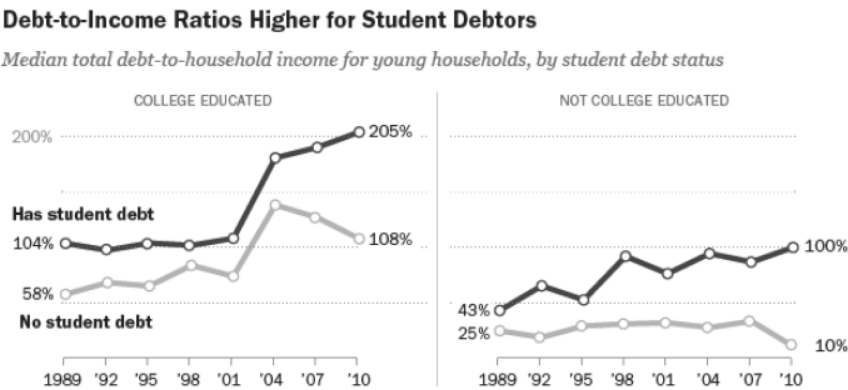


Figure 4: Student Loan Debt Holders Debt-to-Income Ratios Between Those With and Without Student Loan Debt Divided By Households Holding at Least a Bachelor’s Degree and Those Not
Source: PEW Research Center (Fry, 2014)

While a gap between the debt-to-income ratio between those with and without student loan debt has always existed, the difference has become more profound. Since 2004, the gap for college-educated households has grown as the debt-to-income ratio for non-student debt holders decreased and those with student loans have increased. In 2010, college-educated student loan debt holders held just over two years’ worth of income in debt compared to one year by those without the debt. This is significant because as individuals have more debt to pay off, less can be used for savings and retirement planning, putting student loan debt holders at a disadvantage when it comes to saving early. This is supported by a Consumer Financial Protection Bureau report suggesting that millennials divert money from retirement accounts when dealing with debt (Malcolm, 2013). In addition to indebtedness of student loan debt holders, Fry (2014) also looked at income and net worth differences in Figure 5. While there appears to be no difference in income, there is a large gap between the net worth when it comes to having student loan debt.

FIGURE 5

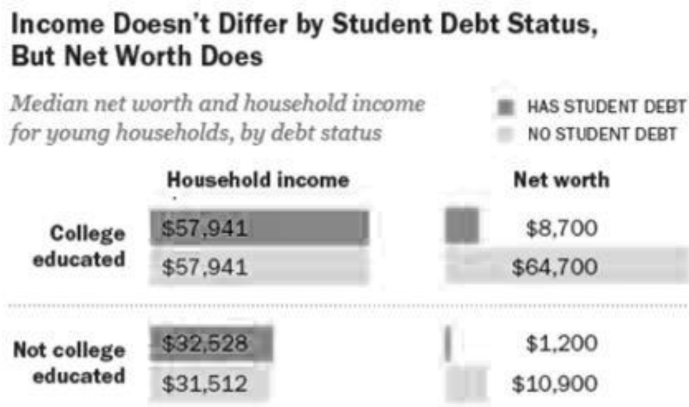


Figure 5: Income and Net Worth Differences Between Those With Student Loan Debt and Those Without Among Households With at Least a Bachelor’s Degree and Those Without a Degree.
Source: PEW Research Center (Fry,2014)

The average net worth for college graduates with student loan debt is just under \$9,000 while those without the debt averaged almost \$65,000. Although the difference is not quite as large for those without a college degree, it still remains true that those without student loan debt have a higher net worth. This could be the result of the double jeopardy that student loan debtors often find themselves in. Students and graduates with high student loan balances often have more overall debt, making it harder for them to pay off debt quickly, save early for major purchases and retirement, and accumulate assets to increase their net worth. Not only does holding high debt balances limit net worth growth and retirement savings, but it might also impede an individual's ability or desire to take out a small business loan (Malcolm, 2013 & Korkki, 2014).

Students at this university had similar credit practices to those across the nation. Students’ credit card use increased as they progressed through college. Seniors held more cards, carried higher balances, and had more overall debt than freshmen. Credit use increased with age, but it also increased with experience. Students with two or more loans often found themselves holding a greater number of credit cards and carrying higher balances on those cards. Although this led them to carry more debt, more experience also led them to have a greater understanding of basic credit management knowledge in the short run. It may, however, be putting them at a disadvantage in the long run. Students that graduate with high student loan debt balances are less likely to own homes, take out small business loans, and have a high net worth. At the same time, they are more likely to hold high mortgage, vehicle,

and credit card balances and a larger part of their income in debt. While research has focused on the credit practices and knowledge of college students and the long-term effects of high student loan debt, very little is done to look at how graduates repay their loans or attempt to get out of debt. This may be an area of focus for future research. Another focus of future research could be on how much experience student loans provide individuals after graduation and once they have begun repaying them.

CONCLUSION

Overall, many of the trends seen at UW-Stout are consistent with previous literature. Although below the national average, credit card use is growing and increasing each year. There were also some alarming discoveries: some students don't feel that their debt is manageable, some make purchases knowing they don't have the money, and some use cards live beyond their means. All of these are indications of poor credit management which may stem from a lack of understanding about credit. Overall, students were only able to answer 53.57% of very basic credit questions correctly. This should be an indication that more education is needed on this subject. The most useful places for this to occur would be around campus and in K-12 schools. Education is best received at a pivotal point in life; for example, credit card education would be best suited to occur around the time when students first begin to use credit cards. Since credit card use increases as students progress through college, a continuing educational program may be more beneficial than a onetime event. A coordinated education program would be able to help students learn more about credit management, but it wouldn't be enough. It is also important, as shown by the influence of parental involvement, that credit management education starts early in the home. Taking a proactive approach, hopefully, will lessen the risky credit behaviors, lack of credit knowledge, and double jeopardy students face. Unsustainable debt accumulation is becoming a nation-wide problem with devastating consequences and the only way to stop it is to prevent credit misuse among the next generation.

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A Cosmological Argument Counterexample

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ABSTRACT

A Cosmological Argument Counterexample, as opposed to the usual cosmological argument, advocates that nature, the physical universe, is all of reality and exists rather than nothing at all because: 1] Something cannot come from nothing; 2] Nature is something; 3] Therefore, nature cannot come from nothing; 4] This means nature was never created; and 5] There is no alternative to nature existing; 6] Therefore, nature has an infinite past and future.

William Craig is currently the most prominent advocate of the Cosmological Argument for the existence of a god. In this paper it is argued that Craig is mistaken. An examination of his main argument reveals that only a physicalistic model of nature can be true (i.e. totally accurate and totally reliable).

Key words: naturalism, physical, cause, supernatural, supernaturalism, creation, Craig.

Craig's Argument

The usual cosmological arguments are aimed at using a god to explain why there is something rather than nothing at all. The Kalam Cosmological Argument is advocated by William Craig (Copan & Craig, 2005; Craig, 2008, 2010). Craig makes the claim that a supernatural creator explains why there is something rather than nothing. Here is that argument in brief: 1] Whatever begins to exist has a cause; 2] The universe began to exist; 3] Therefore, the universe has a cause. Each part will be first elaborated as to how Craig understands it, then his understanding of each part will be evaluated in numerical order.

1] Whatever begins to exist has a cause.

Craig claims that the cause of nature is a personal agent who makes free will (i.e. uncaused) choices and created the contingent reality of nature from nothing. The creator cannot be an abstract object because such objects have no causal efficacy. The creator must be a supernatural, incorporeal (bodiless), transcendent (transcendent of nature) mind (Craig, 2010) because it could not be part of nature. Craig wants to use supernatural causes (Copan & Craig, 2005; Craig, 2008, 2010). Craig maintains that there was a first

(supernatural) cause of nature in which something was caused to come from strictly nothing, not even space-time, fields, quantum vacuum, etc.

2] The universe began to exist.

According to Craig, the Big Bang shows that there was a beginning of nature. Since the Big Bang constitutes the beginning of all space-time and physical things, the cause or creator of nature cannot be space-time or physical things. It must be something other than nature. It must be a nonphysical, immaterial, space-less, timeless, incorporeal, changeless, beginning-less, uncaused, personal, and powerful mind, which Craig claims is his god (Copan & Craig, 2005; Craig, 2008, 2010).

3] Therefore, the universe has a cause.

By a cause Craig means something that brings about or produces its effects (Craig, 2008, 2012). Some background knowledge needed for an evaluation of Craig's argument follows.

Background Knowledge

The first premise of the Kalam argument, whatever begins to exist has a cause, is plausible only if one relates it to nature and physical causes. In physics, a physical cause is a physical force. A physical force is equal to the inertial mass of a physical object multiplied by its acceleration ($F = ma$). The inertial mass is a quantity of resistance to acceleration (Serway & Beichner, 2000). Resistance to acceleration is the signature of the physical. This idea of a physical force was introduced by Isaac Newton in about 1665 and has proven to be useful through 350 years of physics, even at the precision of the subatomic scale. Resistance to acceleration is not only an empirically well-proven definition. If there is nothing to push against, then not even in principle is there anything there. Something exists if and only if it can be pushed against.

In a hypothetical example, assume there is hypothetical object 1 and object 2 and that 1 has resistance to acceleration and 2 does not. Assume 1 and 2 move toward each other. Object 1 passes through 2 without hesitation as though 2 were nothing--because 2 is nothing, nonexistent. To not have at least some resistance to acceleration is to be nothingness, nonexistent. To be nonphysical, or immaterial, is to be nothingness, nonexistent. Nonphysical and existence are mutually exclusive. Nonphysical existence is a contradiction in terms. A contradiction is a condition that is always false. False means inaccurate and/or unreliable. In objection, it may be claimed that a particle of light, a photon, is without mass. A photon has no rest mass, because it is never at rest. Nevertheless, photons do have motion mass (Serway, Moses, &

Moyer, 2005). Photons exert pressure upon the surfaces they strike. That is why surfaces they strike heat up. Photons resist acceleration and are therefore physical. All of space-time cannot have a physical cause, because all physical causes are within space-time. Physical forces work only within space-time, because acceleration can only occur within space-time. A physical cause only works upon prior existing inertial mass (energies), as the equation indicates (m). A physical cause (a physical force) that produced space-time is a contradiction. To physically cause a physical thing to come from strictly nothing is a contradiction, because there is no pre-existing material and no space-time within which a physical cause can act. According to $E = mc^2$, all energy is physical, because the m stands for inertial mass. If X does not have a physical analogue, then X is not real. For example, abstract objects, such as a mathematical triangle, do not have a physical analogue. They are, therefore, not real. There is no physical analogue of a mathematical triangle with lines that have zero height and width and points that have zero height, length, and width. Abstract objects are fictional, ideal models that we make up, and therefore cannot function as real causes. We make up the axioms, definitions, and numbers of mathematics and deduce their implications. Fictions only exist as an energy state or computational state in a computational device, such as the brain. If the supposed cause of nature does not have a physical analogue, then it is not real.

If one who claims there is nonphysical existence is asked to produce such a thing, they cannot do so, because there is nothing to produce. It is at most a fictional thing. To claim there is nonphysical existence and never produce it is to just assume that which needs to be proven. Space-time is a physical thing. In relativity theory, space and time are one thing: space-time. According to the general theory of relativity, there is something called frame dragging (Seife, 2004). A spherical object--such as the Earth--turning in space-time encounters a small resistance to acceleration. This resistance to acceleration has been measured in several ways and means that space-time itself exhibits resistance to acceleration. Therefore, space-time is physical. According to quantum mechanics, space-time is physical. Heisenberg's Principle of Uncertainty for momentum and position in conjunction with Einstein's Principle of Uncertainty for energy and time means that every point in space-time has a nonzero energy and momentum (Serway, Moses, & Moyer, 2005). According to both relativity and quantum mechanics, space-time is a physical object. Any physical thing that has a beginning has a physical cause because of the conservation laws, such as the conservation of mass/energy (energy for short). Physical composite objects, composed of the conserved quantity energy, have a beginning when at least

two energies come together, a physical force occurs, and they stay together. Any physical effect is the result of physical forces (e.g. gravitational, electromagnetic, weak, and strong). Since only the physical can be real, all real causes are physical causes. Any physical effect has only a physical cause. With the nonphysical, there is nothing to exert a force. The inertial mass (m) in $F = ma$ is equal to exactly zero, because the nonphysical is nothing. It therefore cannot exert a force, which means the nonphysical cannot be a cause. A nonphysical mind cannot exert a force because it has zero inertial mass. Therefore, it cannot be a cause.

All claims that nature has a cause of its existence are false. Energy being conserved means that it can never be created nor destroyed. Nature is composed of energy. Therefore, nature can never be created nor destroyed. Since energy cannot be created, there cannot be a beginning of nature. If everything in nature is physically explained, then nature is explained. The quantity of energy of any particular object in nature always exists, changes forms forever, and participates in the forms of an infinite number of particular objects.

Naturalism (ontological) is the idea that there is only natural existence. The natural is physical, material, space, time, and corporeal. The supernatural is not the natural. The supernatural (i.e. transcendental) is the negation of the natural and is therefore nonphysical (i.e. completely empty), immaterial (i.e. completely empty), space-less (i.e. existing at no location), timeless (i.e. existing at no time), and incorporeal (i.e. bodiless). Nonexistence and nothingness are nonphysical, immaterial, space-less, timeless, and incorporeal. There is no difference between the supernatural and nonexistence and nothingness. The supernatural is equal to nonexistence and nothingness.

Supernaturalism is always false because it asserts that there is supernatural existence. Supernatural and existence are mutually exclusive and exhaustive. A supernatural existence (i.e. nonexistence existence) is a contradiction in terms, like a three-angled square in Euclidean geometry, because the supernatural is equal to nonexistence. It is always true that there is no supernatural existence (i.e. supernatural being). A nonphysical being (i.e. nonphysical existence), is a contradiction. It is known by means of facts and reason alone, with total accuracy and reliability, that there is no supernatural existence.

Naturalism is always true, because naturalism and supernaturalism are mutually exclusive and exhaustive (cover all logical possibilities), and supernaturalism is always false. There is no logical alternative to naturalism being true. Nature is equal to all existence. We do not need to search the universe

to prove that there is no god, devil, or supernatural because there is nothing for which to search. Since the supernatural is equal to nonexistence and nothingness, the supernatural cannot be identified, located, observed, measured, or experienced, and cannot be used to predict, control, explain anything, or be a mechanism by which an effect is caused. Since there is nothing to experience, all supposed supernatural experiences are hallucinations.

For example, scientists, engineers, and technologists exclusively work with and explain with the physical, rather than the nonphysical, because the nonphysical is precisely nothing with which to work or explain. The nonphysical is excluded from all empirical detection because there is exactly nothing to detect. In order to be testable for accuracy and reliability, any scientific hypothesis must be operationally defined in terms of the physical.

Argument Evaluation

The first premise of the Kalam argument, whatever begins to exist has a cause, Craig tries to apply to nature, and thereby formulate a definition of his god. Part of Craig's definition of a god is that his god is nonphysical, immaterial, space-less, timeless, incorporeal, and changeless (Copan & Craig, 2005; Craig, 2008, 2010). This part of his definition of a god is therefore equal to nonexistence and nothingness. Beginning-less and uncaused can describe either nothingness or nature. A changeless cause is a contradiction because a cause is an active production of an effect, even according to Craig's definition of cause. Changeless contradicts both exhibiting personality and exerting power. To the supernatural properties of his god Craig adds that his god is personal and powerful (Copan & Craig, 2005; Craig, 2008, 2010). A personal nothing and a powerful nothing are each contradictions. Some of the terms in Craig's definition of his god are mutually exclusive with other terms. Given Craig's definition of a god, God exists is a contradiction in terms. Therefore, the existence of Craig's god has a probability of exactly zero. The fact that Craig's definition of god is a contradiction invalidates all of his arguments for the existence of his god. A mind is the physical functioning of a physical body. A mind is either physical (something) or nonphysical (nothing). Physical and nonphysical are mutually exclusive and exhaustive alternatives. The minds that we actually observe are physical electromagnetic behavioral patterns, energy states, of a physical brain. The electromagnetic force is mediated by photons, light (Serway, 2005). The electromagnetic behavioral patterns in the brain are the qualia, such as imaginings, sights, sounds, tastes, smells, feelings, etc. Those physical behavioral patterns are our personal identity, a person's self. When those patterns stop in a human brain, the person is considered to be dead, no longer existent. A mind is a

physical, space-time phenomenon. The conservation of energy, as well as the conservation of momentum, means that anything that interacts with the physical is physical. If mind interacts with the physical, then mind is physical.

Craig claims that the creator cannot be an abstract object because such objects have no causal efficacy. The creator must be a supernatural mind (Craig, 2010). A supernatural mind is a supernatural existence and is therefore a contradiction. A supernatural mind cannot exist. A nonphysical, disembodied mind is a contradiction. A contradiction cannot be anything or be the cause of anything, including the existence of nature.

Craig's model of his god cannot precisely, accurately, reliably, or successfully predict events. Craig's definition of his god is self-contradictory. Anything at all follows from a contradiction. This means that given his god, there cannot be any true reason to expect anything to be one way rather than another. In general, supernatural existence being a contradiction means that no supernaturalistic model can be predictive because there can never be a true reason to expect anything to be one way rather than another. Such a model cannot successfully make contact with reality. According to Craig (2014), models of a god that theologians make up cannot be predictively tested. They can only be tested for coherence and how well they explain. Nevertheless, if a model does not successfully predict, then it does not successfully explain anything real because it is not successfully in contact with reality and is totally fictional. This means that no model of a god can successfully explain anything in reality. All models of a god are totally fictional. Since supernatural existence is a contradiction, no model of a god can even be coherent with existence.

Craig wants there to be supernatural causes so he can say that his god caused nature (Copan & Craig, 2005; Craig, 2008, 2010). Yet there is no logical possibility of a supernatural causal mechanism. A supernatural cause is a supernatural existence, and therefore is a contradiction. A nonphysical cause is a contradiction. To say that a supernatural existence caused something is like saying that a four-sided triangle in Euclidian geometry caused something. Bringing supernatural existence into premise one renders it always false and the Kalam argument fallacious. A supernatural existence cannot function as an explanation. A supernatural causal explanation is a contradiction. To causally explain nature with supernatural causes or mechanisms is to causally explain something with a contradiction. Nature has infinite past time. If nature began to exist, then it has a supernatural cause. Nature cannot have a supernatural cause because a supernatural cause is a contradiction. Therefore, nature did not begin to exist. All real properties and causes are physical prop-

erties and causes. Something cannot be caused to come into existence out of complete nonexistence, nothingness. Strict nothingness, nonexistence, has no real properties or causal efficacy because there is precisely nothing to have any properties or causal efficacy. The nonphysical, immaterial, spaceless, timeless, and incorporeal cannot have any real properties or causal efficacy. The supernatural, including Craig's god, cannot have any real properties or causal efficacy.

Craig maintains that there was a first cause in which something was caused to come from strictly nothing, not even space-time, fields, quantum vacuum, etc. As shown above, space-time is a physical thing. Space-time, quantum vacuum, and fields are physical states, and not strictly nothing. Creation, to cause something to come from nothing, is a contradiction. A first cause of nature, which causes something to come from nothing, is a contradiction. A cause is something, not nothing. For something to come from nothing is for something to come from no cause. Therefore, to cause something to come from nothing, to cause something to come from no cause, is a contradiction. There cannot be a creation. There cannot be a creator. This is true even if cause is defined the way Craig defines it, as something which brings about or produces its effects (Craig, 2008). Since a first cause of nature is a contradiction, there is an infinite past physical chain of causes and effects. Nature exists by itself, without assistance, and does everything by itself.

Craig's god could not cause the Big Bang simultaneously with the existence of the Big Bang. Even using Craig's own definition of cause, bring about or produce, implies the cause is prior to the effect. The effect does not exist until after it is brought about or produced. A cause is a triggering event and therefore must precede the effect. The support setting for the cause is not thought of as the cause of an effect. A cause cannot be simultaneous with its effect without being part of the effect rather than being a cause. If nature began to exist, then it is a counter-example to the premise that whatever begins to exist has a cause. Since nature is everything that exists, there is nothing else to be its cause. Nature cannot have a cause even if it began to exist. Craig claims that something cannot come from strictly nothing and that his god caused something to come from strictly nothing, which is a contradiction (Copan & Craig, 2005; Craig, 2008, 2010). If something cannot come from strictly nothing, then there cannot be a creation of nature out of strictly nothing. To cause something to come from strictly nothing is a contradiction because there is nothing for a cause to have an effect upon. This means there cannot be an effect and the aforesaid cause cannot be a cause. A cause can only have an effect upon prior existing material. If the Big Bang is an effect, then the Big Bang could not have occurred without prior existing

material. If the Big Bang has a physical cause, then the Big Bang cannot constitute all of nature. No amount of power can have any effect upon strict nothingness because there is nothing to have an effect upon.

The Big Bang cannot come from Craig's god. Recall that Craig claims that something cannot come from strictly nothing (Copan & Craig, 2005; Craig, 2008, 2010). The supernatural, which includes his god, is strictly nothing. This means that something cannot come from the supernatural, including his god. The Big Bang is something. Therefore, the Big Bang cannot come from the supernatural, including his god.

Nature necessarily exists. I agree that something cannot come from strictly nothing. If something exists rather than nothing, then that something cannot come from nothing. That something therefore never began to exist and was never caused to exist. This means that there is no alternative to that something existing and it has existed infinitely into the past. That something is the physical universe because the nonphysical is nothing. Since there is no alternative to nature existing, it will exist infinitely into the future.

If there is a cause of the Big Bang, then it is a physical cause. Again, something cannot come from nothing. The nonphysical is nothing. Something cannot come from the nonphysical. Something can only come from the physical. The Big Bang can only come from the physical. If something cannot come from nothing and the Big Bang is something, then the Big Bang cannot come from nothing. The Big Bang was not caused to come from nothing.

Craig claims that his god is a person with free will. There cannot be free will (i.e. uncaused) choice, because something cannot come from nothing. A choice caused by nothing is something coming from nothing. By a personal cause, Craig means a personal agent who makes free will choices, thereby causing a contingent reality to come into existence from nothing. The choice comes from nothing and the contingent reality comes from nothing, each of which contradicts something not coming from nothing. Free will cannot exist. Therefore, the personal agent god that Craig describes cannot exist. Free will requires the self to cause itself, which is a contradiction (Nichols, 2008). A god causing its uncaused choice would be a contradiction. If whatever begins to exist has a cause and choices begin to exist, then choices have a cause. If nature began from a free will (i.e. uncaused) choice made by a creator, then nature ultimately has no cause. Ultimately, a creator god cannot causally explain anything. The second premise of the Kalam argument, the universe began to exist, assumes that the contents of the Big Bang constitute the entire universe. That is an unproven assumption, rather than a premise that has been proven to be true. An unproven assumption is not known to be true or false, has no known accuracy or reliability, and therefore cannot sup-

port a conclusion. If there is a cause of the Big Bang, it can only be a physical cause, because the nonphysical is nothing. In that case, nature is larger than the contents of the Big Bang. That physical cause determines all of the constants, ratios, and quantities in the Big Bang.

According to my reading on the subject, it is even questionable that the Big Bang began to exist. There is no use for creation or a creator in the Standard Big Bang Theory. A singularity is an open limit point in a scientific theory where there is division by zero. An open limit point can be approached as closely as one wishes, yet there cannot be an arrival, because division by zero is undefined, which means there is no place at which to arrive. The Big Bang Theory tracks back in time to a singularity. The mathematics means that the Big Bang does not have a beginning, because there is no first existence.

If the Big Bang constitutes the entire universe and the Big Bang indeed began to exist, then the universe cannot have a real cause or real causal explanation. All of space-time cannot have a cause, because all causes are within space-time. Even in a universe in which there is a finite amount of time there is no beginning in time, because there is no existence before it, even though there is a first moment of time. This means no cause of that universe is required.

Whether there is a cause of the Big Bang, and what it might be, is in question. Physicists are looking for a physical causal explanation for the Big Bang because the nonphysical is nothing and a nonphysical cause is a contradiction. The physical and the nonphysical are mutually exclusive and exhaustive. The physical universe is all of reality because the nonphysical is nothing. Physicalism, the idea that the physical is equal to the real, is always true.

A cause of nature (i.e. everything real) is a contradiction because it would be necessary for such a cause to have real existence outside of everything that is real. Nature cannot have a cause. There is no real alternative to nature existing.

Physicists have turned to quantum mechanics to try to explain how the Big Bang could happen given prior quantum conditions. There are several hypotheses. At this point, scientists are just not in an evidentiary position to know what happened.

The conclusion of Craig's Kalam argument, the universe has a cause, assumes that there is something other than nature, namely a supernatural existence, which caused nature (Copan & Craig, 2005; Craig, 2008, 2010). Nevertheless, nature is equivalent to reality. Nature causing itself to exist is a contradiction. Nature cannot cause itself, because to do so it would be

necessary for nature to exist before it existed. There is no alternative to nature existing. To transcend nature is a contradiction. Nonphysical cause, spaceless cause, timeless cause, supernatural cause, and transcendental cause are contradictions in terms. A contradiction, a supernatural existence, cannot be a cause of nature.

Thermodynamics

The laws of thermodynamics are some of the most accurate and reliable laws in physics. Craig tries to use the second law of thermodynamics to show that the Big Bang deflates back to a beginning if time is reversed. He does not account for the first law of thermodynamics (Craig, 2010). We know that nature has already existed forever because of the first law of thermodynamics. The first law of thermodynamics is the conservation of energy, which means that although energy is always changing form, the total quantity of energy in nature is always constant (Chaisson & McMillan, 2004; Cutnell & Johnson, 2004; Serway & Beichner, 2000).

Since energy can never be created nor destroyed, the same total quantity of energy has existed infinitely into the past and will exist infinitely into the future. It has no beginning, does not need to be sustained in existence, and it has no end. All subatomic particles oscillate (Serway, Moses, & Moyer, 2005). Energy is always in action. That is why motion exists and why something happens rather than nothing.

Since energy has no beginning, there is no cause of its existence. The properties of energy explain why there is something rather than nothing at all and why there continues to be something rather than nothing at all. Nature is composed of energy. Therefore, nature has all of the above properties of energy.

A physical pattern indicates that there is a substructure of physical order. Since naturalism is always true, there can only be physicalistic reasons for why nature has the constants, ratios, and quantities that it does. Life is a part of nature and is adjusted to the rest of nature by natural selection. The rest of nature is not adjusted to life. Life is a physical phenomenon.

The second law of thermodynamics states that entropy (energy disorganization) always increases or remains constant if there is no energy input into or output from an isolated system. The total entropy of the universe does not change when a reversible process occurs and does increase when an irreversible process occurs (Cutnell & Johnson, 2004). The second law of thermodynamics depends upon the first law of thermodynamics being true.

Entropy cannot be constant at its maximum or we would not exist, because energy would be too dispersed for stars and planets to exist. Given that past time is infinite (because of the first law of thermodynamics and

creation being a contradiction), if nature is finite in energy, then by now maximum entropy would have been reached and we would not exist, because energy would be too dissipated. Maximum entropy has not been reached and we do exist. Therefore, nature is not finite in energy. The laws of thermodynamics, in combination with our existence, necessitate that nature be infinite in energy.

The entire Big Bang is only an infinitesimal dot in an infinite universe. The total energy in nature is equal to the absolute value of the positive (kinetic) energy plus the absolute value of the negative (potential) energy. The total quantity of energy in the universe is infinite and constant, similar to the quantity of integers.

If time is viewed in reverse, nature does not ultimately deflate back to a beginning. The total energy of nature is constant because of the first law of thermodynamics (Serway & Beichner, 2000). Given infinite time, because the total energy is constant, if the average entropy of nature or the average temperature of nature increased or decreased, then we would not exist, because nature would be too cold or too hot. The average temperature of nature must be constant and the average entropy of nature must be constant below its maximum level or we would not exist. This means there is no overall inflation or deflation of nature.

CONCLUSION

Craig's Kalam cosmological argument is indefensible. Creation is a contradiction. Supernatural existence and supernatural cause are each contradictions. Craig contradicts himself in that he asserts that something cannot come from nothing and that his god caused something to come from nothing. In defining his god, Craig fails to refer to anything that can be real, because his definition is a contradiction in terms. It is totally accurate and totally reliable that there is no real alternative to nature existing; nature exists by itself and does everything on its own; nature is infinitely old and will exist infinitely into the future; nature is infinite in energy; and nature is equal to reality.

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Environmental Factors Influencing Wood Frog (*Lythobates sylvaticus*) Tadpole Size

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Environmental Science

ABSTRACT

Body size variation among individuals and populations within a species is important to study due to the ecological implications, specifically life history population dynamics. Variation in growth among individuals has been attributed to both inherent biological and environmental factors affecting an organism. Several models have been proposed to describe life history variation and tradeoffs. Understanding the controlling influence of body size variation in amphibians requires consideration of all factors. We evaluated which environmental factors have an impact on *Lythobates sylvaticus* tadpole body size. Our study site consisted of 57 wetlands (41 ephemeral and 16 permanent) in Chippewa County, Wisconsin. Tadpole body sizes, measured as snout vent lengths (SVLs), were surveyed in each wetland using minnow traps collected after 24 hours of being submerged. Environmental factors, including dissolved oxygen, canopy cover, pH, temperature, hydroperiod, and chlorophyll-a were quantified. We also considered possible size variations occurring in permanent versus ephemeral wetlands. Tadpoles in permanent ponds were significantly larger ($F_{1,18} = 7.34$, $p\text{-value} = 0.014$) than those in ephemeral ponds. Out of the environmental factors, pH resulted in a positive correlation with tadpole size (Adjusted $R^2 = 0.38$, $F_{2,17}$, $p\text{-value} = 0.006$). The results of our research provide evidence for a relationship between amphibian body size and environmental characteristics. The pH of wetlands may serve as a proxy for the relationship between peat accumulation, or immediate upland landscapes, most often acidifying Pinaceae family and the SVL of *L. sylvaticus*.

Keywords: body size, ephemeral ponds, *Lythobates sylvaticus*

INTRODUCTION

Body size variation among individuals and populations within a species is important to study due to the ecological implications, specifically life history population dynamics. Variation in growth among individuals has been attributed to both inherent biological and environmental factors affecting an organism. Several models have been proposed to describe life history variation and tradeoffs. Life history traits such as age at reproduction, length

of reproduction capabilities, and quantity of offspring, including size and number, all dictate success of species survivorship (Charnov 1993). Furthermore, reproductive value (RV) models the tradeoffs between survivorship, quantity of offspring, and growth (Charnov 1993). The RV model states that depending on the ecological situation organisms will adapt to reproductive outcomes, including size of offspring. The "island rule" offers another size variation theory based on the segregation of one population from another. In the case of populations, segregation means a physical barrier is preventing contact of the two groups. This rule suggests that when segregated, larger organisms will become miniaturized and vice versa at a faster rate and larger scale than non-segregated organisms (Millien 2004). Variation in body size may be due to limited food resources, which restrict or promote growth. Size variation has also been found to be dependent on available food resources according to numerous studies on organisms ranging from mammals to gastropods. Hutchinson (1959) suggested that differentiation in body size may be associated with a reduction in interspecific competition. Research studies investigating adaptation to competitive interactions have noticed a shift in body size, perhaps associated with resource utilization (Brown & Wilson 1956; Adams 2007; Slatkin 1980). A study on *Tarebia granifera* (quilted melania) demonstrated that level of competition, in terms of reaction speed to a food source, was dependent upon body size, which dictated the level of success among individuals (Snider 2008). Thus, competitive dynamics over a limited resource can influence body size variation among species.

Amphibian growth rates and body size are ultimately related to survival. In accordance with the food resource model, tadpoles were observed selectively foraging high protein diatoms that supported rapid growth (Kupferberg 1997); however, some studies have found tadpole growth rates to be independent of food availability (Bardsley 2000). The hatching time of tadpole larvae may influence body size. Wood frog (*Lithobates sylvaticus*) tadpoles that hatch earlier than others may initially be smaller, but may grow the most and at a faster rate. These tadpoles also metamorphosed earlier than the younger tadpoles, suggesting an advantage to early hatching times (Warne 2013). Hydroperiod has to be taken into consideration as well. The survival rate and size of tadpoles is greatly affected by the length of time a pond holds standing water (Amburgey 2012). While many hypotheses have been proposed for the variation of body size, it remains unclear as to which factors. Physiological or environmental are most important.

Understanding the factors that may influence body size variation in amphibians requires thorough consideration. In order to further evaluate these hypotheses, we focused on *Lithobates sylvaticus* tadpoles in the glaci-

ated Western Wisconsin landscape to test which environmental factors have an impact on body size. Our study site consisted of 57 wetlands (41 ephemeral and 16 permanent) in Chippewa County, Wisconsin. Tadpole body size, measured as snout vent lengths (SVLs), were surveyed in each wetland using minnow traps collected after 24 hours of being submerged. Environmental factors, including dissolved oxygen, canopy cover, pH, temperature, hydroperiod, and chlorophyll-a were quantified. We also considered possible size variations occurring among permanent and ephemeral wetlands. Knowing permanent wetlands have standing water year round, the tadpole's metamorphosis is not constrained by water duration, but offers the possible risk of more predators.

METHODS

Study Area

This study was conducted in the Chippewa Moraine State Recreation Area in Chippewa County, Wisconsin (45° 13' 13.32" N, 91° 24' 39.7" W) in six large (≥ 5.0 Hectare) wetland systems. This area is heavily forested and surrounded by many kettle lakes created by the most recent glacial ice age. Within the study area, there are both permanent wetlands and ephemeral ponds.

Amphibian Sampling

Amphibians were surveyed during May 2013 using minnow traps. Amphibians were sampled over a one-week time period using minnow traps with three traps per ephemeral pond and four traps per permanent pond. The minnow traps were dispersed near the perimeter of each pond (distance from dry land ≥ 0.25 m) and submerged half way into the water column, leaving sufficient space for tadpoles to enter. The traps remained in the ponds for 24 hours. After 24 hours, the traps were pulled from the ponds and the tadpoles were identified and measured from the tip of the snout to the vent. The species, visible metamorphosis characteristics, and SVL were recorded. Once data was recorded from each captured tadpole, they were released to the wetland.

Environmental Characteristics

Dissolved oxygen, temperature, and pH readings were obtained three times during the May-August wetland season using a YSI Pro20 dissolved oxygen meter to capture variability. Readings were taken at three locations within each pond (two near perimeter and one in the center). The probe was lowered halfway into the water column and recorded after values stabilized. Tree canopy cover was quantified using a convex spherical densiometer.

Three water samples (1000mL each) were collected from each pond using light impenetrable Nalgene bottles to prevent Chlorophyll A degradation. Two samples were taken near the perimeter of the wetland and one sample from the middle in

order to account for variability. The water samples were chilled in portable coolers with ice packs in order to prevent chlorophyll-a degradation. Chlorophyll-a was quantified according to standard operating procedures.

Statistical Analysis

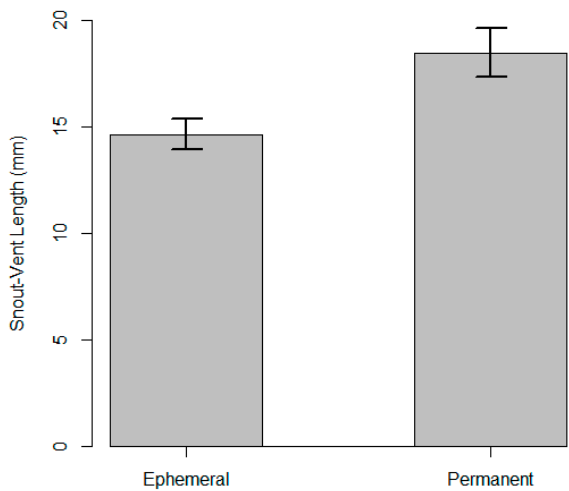
We used multiple regression to assess the relationship between tadpole SVL and the quantified environmental characteristics. We also assessed the variation in mean SVL among ephemeral and permanent wetlands by performing an analysis of variance (ANOVA). Upon finding a significant relationship between body size and wetland classification, we conducted an analysis of covariance (ANCOVA) to assess whether variation in environmental characteristics among the different wetland classes was explaining the variation of tadpole body size among permanent and ephemeral wetlands.

RESULTS

Out of the 40 ephemeral ponds surveyed, only half contained *L.sylvaticus* tadpoles. The mean SVL was 13.7 mm ($\pm$ 8.19). Minimum SVL was 8.33 mm and maximum was 20.2 mm.

We found conclusive support of tadpole body size variation between ephemeral and permanent ponds. Mean body size was significantly larger in tadpoles sampled from permanent wetlands (Figure 1, $F_{1,18} = 7.34$, $p\text{-value} = 0.014$). Mean body size of tadpoles was 14.65 mm (SE = 0.72) in ephemeral wetlands and 18.48 mm (SE = 1.16) in permanent wetlands.

FIGURE 1

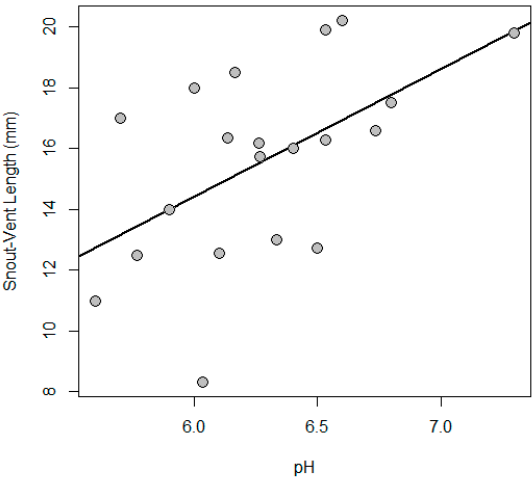


Dissolved oxygen, temperature, canopy cover, and chlorophyll-A were not significantly correlated with SVL after conducting stepwise multiple regression analyses on each environmental factor. Water chemistry variables differed greatly as shown by the wide range of values (Table 1). pH was the only environmental factor to be significantly correlated with SVL ($R^2 = 0.30$, $F_{1,18} = 7.56$, $p\text{-value} = 0.013$, Figure 2). The result of the ANCOVA indicated that both wetland classification (permanent and ephemeral) and pH explain a significant proportion of the variation in SVL (Adjusted $R^2 = 0.38$, $F_{2,17}$, $p\text{-value} = 0.006$).

TABLE 1

Variable	Mean	Minimum	Maximum
Dissolved oxygen (mg/L)	1.8	0.3	7.0
pH	5.9	5.9	6.6
Temperature (°C)	17.1	13.2	22.2

FIGURE 2



DISCUSSION

The potential influences of body size variation include: wetland duration, resources, predators, water temperature, and competition. Further studies are needed to conclude which sources have the greatest impact on the body size variance in permanent versus ephemeral ponds. We determined pH was the only significant factor having a correlation with SVL in ephemeral ponds and permanent wetlands. We believe factors affecting pH are most likely litter inputs and peat accumulation, in addition to geological characteristics. Studies examining types of leaf litter have indicated that tadpole size may be related to both the species of amphibian and species of trees supplying leaf litter to the aquatic system (Stoler & Reylea, 2011). Further, leaf litter has an influence on phytoplankton and zooplankton, which will not only be associated with water chemistry, but also food resources for tadpoles. Thus, pH of wetlands may serve as a proxy for the relationship between immediate upland landscapes, most often acidifying Pinaceae family, and the SVL of *L. sylvaticus*. As pH increases, SVL increases; thus more basic wetlands are likely to have sustainable populations due to larger amphibians. Wetland ecosystems are ultimately driven by primary producers, which depend on nutrients and sunlight availability, both of which are provided by the immediate surrounding landscape.

While our study focused on *L. sylvaticus*, it is important to realize the potential implications of our results on other members of the biological community that consume and are consumed by *L. sylvaticus*. Wetlands provide flood protection, filtration of harmful pollutants, and other benefits that are significant economic benefits. The potential relationship between leaf litter, wetland pH, and the basal components of the aquatic food web suggest that these wetlands are functionally linked to the adjacent upland forests. Previous research in this type of wetland also suggests that land use in upland forests have a significant impact on wetland communities (Hanson, Palik, Church, & Miller, 2010). Tree harvesting in upland forests creates changes in permanent and ephemeral ponds, such as reduced invertebrate variability. These results suggest that forested wetlands require significant protection. Future studies designed to evaluate multiple species of animals and plants of wetlands would promote a better understanding of biodiversity functions of wetland ecosystems. With expansive research we believe conservation policy could be greatly beneficial to the greater watersheds.

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The Impact of a Citation on Underage Drinking Behaviors: Gendered Differences

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ABSTRACT

Underage drinking is integrated into the college culture and carries negative consequences such as underage drinking citations. A more critical look into this topic is important as the frequency of underage drinking remains high and current intervention methods have not been proven to be effective (Spoth, Greenburg & Turrise, 2009). This nonrandom pilot study investigated attitudes about underage drinking by surveying 101 male and female college students living on a Midwestern college campus. It was hypothesized that males would be less likely than females to change their drinking behaviors if they received an underage drinking citation. We found support for our hypothesis in that males were approximately 20% less likely to see an underage drinking citation as a deterrent for them to continue drinking underage than females. Implications for practitioners include being attentive to the gender differences when designing alcohol prevention programs and not assuming that a citation will serve as a deterrent. Future research would benefit from a large, randomized national sample and a mixed methods approach to include the qualitative lived experience of the participants.

Key Words: alcohol, underage drinking, college students, binge drinking, drinking citations

Underage drinking is increasingly common among college students across the United States (Brown, Matousek & Radue, 2009). Consuming alcohol before the legal age of 21 is considered underage drinking (Windle & Zucker, 2010). There are some exceptions for consuming alcohol with your family or different locations. There are several negative consequences of consuming alcohol underage that have been supported through research. Many measures have been taken to prevent underage consumption, including law enforcement issuing underage consumption or public intoxication citations. This nonrandom pilot study focused on underage drinking citations and the impact a citation may have on the underage drinking behaviors of college students. There is a need for this research because it is unclear if underage drinking laws have successfully caused a decrease in the prevalence

of underage drinking (Spath, Greenburg & Turrissi, 2009). The purpose of this study was to examine the attitudes towards underage drinking and receiving an underage drinking citation, and to compare the attitudes between males and females. We hoped to provide insight and awareness to universities, law enforcement, and policy makers for future investigation and research on underage drinking citations and effective interventions.

The central research question in this study was: "How does receiving an underage drinking citation affect the future drinking behaviors related to gender in college students?" It was hypothesized that males would be more likely than females to not change their drinking behaviors after receiving a citation. This hypothesis was based on the Social Exchange Theory and societal norms. Males are more likely to go against society standards and underage drink before 12th grade (Windle & Zucker, 2010).

A review of the literature was conducted to explore how receiving an underage drinking citation would affect the future drinking behaviors of college students related to gender. The search engine, EBSCOhost, was used to find five best-practice articles that were selected to inform the study. All five studies reported the negative ramifications that resulted from drinking alcohol (Wardell & Read, 2012; Linowski & DiFulvio, 2011; Windle & Zucker, 2010; Spoth et al., 2009; Brown et al., 2009).

Wardell and Read (2012) conducted a three-year longitudinal study to determine the reciprocal relationship between positive beliefs about alcohol and perceived norms of alcohol use in college, and how that relationship is associated with actual alcohol use amongst college students. The same sample of college students was surveyed upon entering their first year of college, again entering their second year, and finally in the fall semester of their third year. Results indicated that what an individual thinks is the norm can cause them to drink more over time in order to comply with those perceived norms. This study suggested that the majority of students will follow perceived norms, and this could be related to the drinking-related choices a student makes after they have received a citation.

Linowski and DiFulvio (2011) provided insight into college students' binge drinking. They discovered that campus and community leaders have a significant influence on college student attitudes towards drinking. In their research they found that if a coalition is created within that community, the chances of changing attitudes towards drinking increases. This coalition was made of members throughout the college and local community. A four-step tier emerged in terms of what the best solution was to the problem. The four steps were campus coalition, environmental strategies, community level changes, and student outcomes. Changing attitudes towards binge drinking is

a multi-layered campus and community effort.

Windle and Zucker (2010) researched how underage drinking affected individuals during the critical developmental period of adolescence. Underage drinkers were responsible for sixteen percent of alcohol sales. The likelihood of developing alcoholism is higher when a person binge drinks at a young age. Forty years prior to the study it was believed that alcoholism was considered only an adult disease that was driven by physiological factors. Underage drinking has increased, while at the same time alcohol dependence in late adolescence and young adulthood has declined over the years. It was also found that the oldest of young adult males were more likely to experience a dependence on alcohol than their female counterparts. The researchers found that early intervention can prevent alcohol dependency as well as future drinking behavior.

Spoth et al. (2009) conducted an inclusive review of literature that considered the effectiveness of existing interventions on underage drinking. The authors analyzed several methods of preventative intervention to determine which methods were most effective. Of more than 400 different interventions, 127 were assessed for effectiveness. It was found that only about one-third of the assessed interventions had evidence of positive outcomes. Law-related intervention was assessed, particularly the passage of laws that raised the minimum drinking age. Although some research has indicated that the passage of these laws could reduce the rates of underage drinking, it was not clear whether the rates actually declined or if the individuals just started drinking in different settings. As a result of this study, raising the minimum drinking age was not considered a measure that was promising. This study suggested that although these laws are in place, people will not necessarily follow them. It does not, however, look into the effectiveness of getting a citation from breaking these laws, and if adolescents are less likely to drink after getting caught.

Brown et al. (2009) explored the issue of legal-age students providing alcohol to underage college students. Using qualitative methodology, participants ages 21 and older, were placed into 16 focus groups that were invited to discussions held on this topic. Topics discussed were the reasons, social expectations, risks, and attitudes about preventative methods for the provision of alcohol to underage students. The majority of participants agreed that the social rewards for providing alcohol outweighed the potential consequences. Many also agreed that the most effective methods of intervention would involve more strict law enforcement and higher legal penalties. Although this study focused on legal-age students, there was significant focus on underage students' drinking behaviors and means of obtaining alcohol. The overall

consensus amongst the participants was that drinking is a part of the college culture and students were willing to take risks in order to adhere to the social expectations of college drinking.

After conducting this literature review, we believe that the current data supports that drinking in college is part of the "culture" and students are expected to conform to these norms. There is also data that determined the effectiveness of interventions and what methods are the most promising. However, there is limited research done on the specific effectiveness of citations and fines for underage drinkers that are apprehended by law enforcement. Our objective is to determine if underage college students change their drinking behaviors after receiving a citation.

Theoretical Framework

The theory used to guide this study was the Social Exchange Theory. The Exchange Theory can help explain how individuals make personal decisions. This theory suggests that individuals make behavioral decisions based on a cost-benefit evaluation (Moore & Asay, 2013). Benefits are the gratifications, satisfactions, and pleasures that a person receives from making a certain decision. Each benefit, tangible or intangible, can in turn be reinforcement if that individual achieves the outcome they are seeking. Reinforcements can increase the likelihood of a certain behavior or influence future decision-making. Costs are exactly the opposite and involve the possible consequences of a behavior or decision. Consequences may prevent a person from making that decision again in the future. The overall assumption is that an individual's main goal is to increase their benefits and decrease their costs to pursue their self-interest.

The Social Exchange Theory can be applied to our research question, "How does receiving an underage drinking citation affect the future drinking behaviors related to gender in college students?" This theory assumes that the student will compare and contrast the costs and benefits of continuing to drink after receiving a drinking citation. Using Social Exchange Theory, it could be predicted that findings will show students who have received a drinking citation would choose to not drink or there would at least be a decrease in their future underage drinking behavior. Given the association between masculinity and drinking in this society, males may have more of a tendency to determine that there are more benefits than costs when making decisions about drinking.

Methods & Participants

This study was conducted at a small public university in northwestern Wisconsin. All of the participants lived in the residence halls on-campus; see demographic information, Table 1.

Demographic Table

Gender	Age	I Drank Underage	Number of Citations Received
Male= 33	18-20 years old=86	No, I haven't drunk underage= 23	0 Citations= 85
Female=68	21-23 years old=15	Yes, I have drunk underage= 75	1 Citation= 12
		I prefer not to answer= 3	2 Citations= 3
			3 Citations= 0
			4 Citations= 1

Research Design

We used a cross-sectional research design in order to evaluate the effect of underage drinking citations on students at one point in time. An anonymous online university secure survey instrument, Qualtrics, was used for data collection. The rationale for this method is that an online survey could be completed in private, due to the potential risks in disclosing information about alcohol and convenience.

The sampling design used in the study was non-random, purposive, and snowball. We did not randomize given that we wanted to preserve every participant for our sample size. The snowball sampling involved networking through one of the investigators and his connections with University Housing. This study was approved by the Institutional Review Board (IRB). The ethical protection of human subjects was provided through the completion of the IRB's Human Subjects training.

Data Collection Instrument

The survey was designed to compare underage drinking behaviors between genders. A brief description of the study, definition of any terms not commonly known, risks and benefits, time commitment, confidentiality, voluntary participation, our contact information as well as our supervisor's contact information, and instructions for completing the survey were included on the instrument. Statements for the survey were created by reviewing the best practice literature.

Procedure

The Director of University Housing referred us to the Assistant Director whom we met with to confirm collaboration for data collection in the residence halls. We were advised that freshmen would not be included due to possible survey fatigue. We did not attempt to randomize our sample because we needed every participant. Data collection using the online secure survey program, Qualtrics, began October 28th, 2013 and ended on November 7th, 2013.

Data Analysis Plan

The data was cleaned by the Qualtrics software and any incomplete surveys were automatically grouped into a separate category and were not used in the analysis. All completed surveys were then coded using acronyms for each variable. All demographic questions were given a three-letter acronym: Gender of the participants (GEN); Age of the participants (AGE); Participation in underage drinking (PAR); Number of underage drinking citations received (NUM). Each survey statement was also given a three letter acronym: It is acceptable to consume alcohol prior to the age of 21 (ACC); Underage drinking is an important part of the college culture (CCD); Drinking underage is necessary to fit in with peers (FIT); People I consider my friends drink underage (CFD); People I consider my friends drank underage (FDR); It is fairly easy to access alcohol while underage (AAC); Binge drinking (5 or more drinks within a few hours) is common for underage drinkers (BDC); It is fair that underage drinking has consequences (CND); Citations are a fair penalty for underage drinkers (CPN); Receiving an underage drinking citation would be a deterrent for me to stop consuming alcohol until I was 21 years of age (CDT); Drinking has a negative impact in the Residence Halls (NRH); Authorities (police, RA's, Hall Directors, Security Assistants, etc.) play an important role in maintaining a safe environment on campus by enforcing laws and rules, including underage drinking citations (MSC).

The data was analyzed by downloading the data from the Qualtrics software to the computer program Statistical Package for the Social Sciences (SPSS). Groups were compared; the data analysis included cross-tabulations,

frequencies, mean comparisons, and Independent T-tests. Cronbach's Alpha reliability analysis was also conducted.

RESULTS

The research question investigated in this study was: "How does receiving an underage drinking citation affect the future drinking behaviors in college students related to gender?"

We predicted that males would be less likely to change their drinking behaviors after receiving an underage drinking citation. We did not find statistically significant differences between the genders but did find support for our hypothesis in the Cross tabulations--males were approximately 40% less likely (39% vs. 24% of females) to see an underage drinking citation as a deterrent for them to continue drinking underage when taking into account the SD/D responses (CDT) on the six point Likert scale. Please see Cross-Tabulations, Table 1 below.

ACC							
GEN	SD	D	SLD	SLA	A	SA	Total
Male	15.2%	6.1%	9.1%	12.1%	30.3%	27.3%	100%
Female	7.4%	7.4%	10.3%	41.2%	23.5%	10.3%	100%

CCD							
GEN	SD	D	SLD	SLA	A	SA	Total
Male	21.2%	6.1%	15.2%	18.2%	27.3%	12.1%	100%
Female	19.1%	17.6%	17.6%	29.4%	13.2%	2.9%	100%

FIT							
GEN	SD	D	SLD	SLA	A	SA	Total
Male	27.3%	36.4%	12.1%	15.2%	3.0%	6.1%	100%
Female	38.8%	38.8%	11.9%	9.0%	1.5%	0.0%	100%

CFD							
GEN	SD	D	SLD	SLA	A	SA	Total
Male	9.1%	9.1%	6.1%	21.2%	33.3%	21.2%	100%
Female	2.9%	8.8%	5.9%	23.5%	38.2%	20.6%	100%

FDR							
GEN	SD	D	SLD	SLA	A	SA	Total
Male	6.1%	6.1%	9.1%	18.2%	33.3%	27.3%	100%
Female	1.5%	7.4%	4.4%	20.6%	44.1%	22.1%	100%

AAC							
GEN	SD	D	SLD	SLA	A	SA	Total
Male	3.1%	6.2%	6.2%	25.0%	25.0%	34.4%	100%
Female	1.5%	1.5%	10.4%	26.9%	38.8%	20.9%	100%

BDC							
GEN	SD	D	SLD	SLA	A	SA	Total
Male	3.0%	9.1%	15.2%	12.1%	39.4%	21.2%	100%
Female	4.4%	10.3%	16.2%	26.5%	26.5%	16.2%	100%

CND							
GEN	SD	D	SLD	SLA	A	SA	Total
Male							
Female							

Note. (GEN)=Gender; (ACC)= It is acceptable to consume alcohol prior to the age of 21; (CCD)= Underage drinking is an important part of the college culture; (FIT)= Drinking underage is necessary to fit in with peers; (CFD)= People I consider my friends drink underage; (FDR)= People I consider my friends drank underage; (AAC)= It is fairly easy to access alcohol while underage; (BDC)= Binge drinking is common for underage drinkers; (CND)= It is fair that underage drinking has consequences; (CPN)= Citations are a fair penalty for underage drinkers; (CDT)= Receiving an underage drinking citation would be a deterrent for me to stop consuming alcohol until I was 21 years of age; (NRH)= Drinking has a negative impact on Residence Halls; (MSC)= Authorities (police, RAs, Hall Directors, Security Assistants, etc.) play an

important role in maintaining a safe environment on campus by enforcing laws and rules, including underage drinking citations.

A reliability analysis was run to indicate if the 12 variables (ACC, CCD, FIT, CFD, FDR, AAC, BDC, CND, CPN, CDT, NRH, & MSC) were a reliable index to measure the major concept: The impact of an underage drinking citation on underage drinking behaviors. Cronbach's Alpha is a measure of reliability and in this analysis was 0.259. This low value indicated that the survey statements were not a reliable measure of the major concept. We speculate that since the majority of the students had not received a citation, they might have felt the survey statements did not apply to them when taking the survey. However, we also speculate that some of the participants might have thought they were "smarter drinkers" than their peers who have been caught underage drinking. Qualitative comments were received at the end of 18 of our surveys and will be further analyzed in the Discussion section.

DISCUSSION

Underage drinking has become prevalent in colleges today (Wardell & Read, 2012). Since consuming alcohol before the legal age of 21 has been proven to have many negative effects on development, many preventative measures have been implemented to reduce the prevalence of underage drinking. Since the minimum legal drinking age was raised to 21 years, underage drinking citations are issued by law enforcement officers to any person that consumes alcohol under the legal age. However, there is not substantial evidence that underage drinking citations have actually caused a decline in the rates of underage drinking (Spoth et al., 2009). There is very minimal research comparing genders on this topic. We found support for our hypothesis that males would be more likely than females to not change their drinking behaviors after receiving a citation; cross tabulation results showed approximately a 40% difference between genders. The Social Exchange Theory also illustrated support for our hypothesis. According to this theory, individuals make decisions based on a cost-benefit analysis. It is also true that costs and benefits can be defined differently by each gender (Chadwick-Jones, 1976). Given the association between masculinity and drinking in this society, we predicted that males would find more benefits to drinking even after receiving a citation.

For both genders the majority slightly agreed that drinking is an important part of the college culture and that they have friends that drink/drank underage. This is consistent with the findings from a qualitative study on providing alcohol to minors, where all participants explained that drinking was a very important part of the college culture (Brown et al., 2009). Interestingly enough, the majority for both groups then disagreed that drinking is

necessary to fit in with peers, which is not supportive of that same study that found providing alcohol to minors was important to fit in.

Both males and females mutually agreed that it was easy to access alcohol while under the legal age. This is consistent with the qualitative study on providing alcohol to minors as mentioned earlier, in that the majority of participants (all 21 and over) had provided alcohol to other underage students (Brown et al., 2009). In accordance with this same qualitative study, there was also agreement between both genders that it is acceptable to drink underage and that binge drinking (consuming five or more drinks within a few hours) is common for underage drinkers.

Although both genders overall agreed that it was fair for there to be consequences to underage drinking, there was a difference between genders when asked if they thought citations were a fair consequence for underage drinking. 63% of females agreed while only 42% of males agreed that citations are fair. This difference is reflective of the support found for our hypothesis and could suggest that since males do not agree that citations are fair, that is why they may be less likely than females to see a citation as a deterrent. Another difference between groups was found when asking if they believed that underage drinking has a negative impact on the residence halls in which they live. More males than females disagreed with this statement. There was no support found in the literature for why males may see drinking as not having a negative impact on living situations. We believe that applying the Social Exchange Theory can address why males might not believe that underage drinking has a negative impact. Males might view only the benefits in drinking versus the cost.

We were also curious as to what attitudes the students have about authority figures (police, resident advisors, hall directors, security assistants, etc.) on campus and if they have an important role in maintaining a safe environment on campus by enforcing laws and rules, including underage drinking citations. It was found on our cross tabulation analysis that there was a 19% difference: that females agreed more so than males to this statement. This is partially consistent with the same study mentioned earlier in that the participants suggested that law enforcement posed a threat to underage drinking, but it was mentioned that if police were more strict that law enforcement may have a bigger impact (Brown et al., 2009).

Qualitative Comments

There was one qualitative question at the end of the survey asking if there was anything the participants wanted us to know. We were intrigued by the 18 comments that were received. Six of the responses all touched on

the idea that underage drinking is acceptable and safe as long as it is done responsibly. One representative comment from a participant:

"As a mature female, I drink underage, but I handle myself. There is a difference between getting drunk vs getting plastered. I got a citation as a freshman and it taught me to be more sneaky. It is not going to change my "habits", I am not an alcoholic, but I enjoy drinking with my friends."

Some of the qualitative data suggested that peers and lack of other "fun" activities have influenced them to begin drinking underage. One participant stated:

"Before college I did not participate in drinking and I did not agree with it either. Since this school does not have a lot going on during the weekends it kind of became the only fun option. The first semester I think I drank once and that was because I received a lot of pressure from my so-called friends. If this school offered more and had more school spirit and a better college atmosphere I would participate in other things. This is somewhat why I am transferring. I need a school that offers more than sad parties and drinking."

Overall, most of the qualitative responses included perspectives about "drinking smart" and that there are times when citations are not fair. Most implied that it all depends on the context of the situation and the experience of the drinker; however, comments did not focus on legal age.

Limitations

A limitation to this study dealt with the time deadline for the survey. If the survey could have been open longer, it would have allowed more time for participants to respond. Another limitation is that we did not randomize, which means we cannot generalize our findings to the larger population of college students. However, this was meant to be an exploratory pilot study. We also could have increased our sample size if the survey would have been sent to all of the residence halls. We could not send the survey to any of the freshmen residence halls because our collaborator was concerned that freshmen will get survey fatigue. The first year students had taken three surveys in the fall. An additional limitation was that we needed to exclude those students who self-identified their gender from the analysis because of the small sample size of this gender category.

Implications for Practitioners

This study has multiple implications. It provides the chance to expand the knowledge of professionals working in the college environment and target interventions to focus on gender differences. This research may be

helpful for professionals who address underage drinking on college campuses such as Student Services, University Housing, and Counseling Centers. It could inspire professionals to assess the current intervention methods for underage drinking and motivate more research on underage drinking behaviors.

The data from this study could also be used by educators and police to assess their intervention programs for underage drinking and reassess deterrents outside of issuing citations.

Implications for Future Research

It is recommended that future research include a random, large, national sample to be able to generalize the results. Furthermore, future research could investigate the impact of family and social environments on attitudes and behaviors towards drinking.

We were curious if results would be different if the study was done in a different area, given that this Midwestern state is known for a high prevalence of alcoholism and binge drinking (Brown et al., 2009). We also suggest that there should be research that focuses on the relationship between peer pressure and underage drinking. A mixed methods approach of both quantitative data supplemented by qualitative interviewing would provide much richer lived experience of the participants addressing issues of what actually would be real deterrents for underage drinking.

CONCLUSION

Conducting this research has contributed to the under-studied area relating to the impact of underage drinking citations. It has also been made apparent that there is little attention paid to the differences in gender when related to underage drinking and how that knowledge can be important when assessing preventative measures. The current intervention methods for underage drinking are uncertain in their effectiveness; therefore, the first place to start is with the policies in place. The laws currently in place concerning underage drinking have not been proven to reduce frequency. This could suggest that there is a need for a new path to keeping teens and young adults safe and healthy when they are handed their first drink. Emphasis on increasing knowledge and awareness about alcohol and its effect on health and development may be a good place to start. It is important for professionals in mental health and law enforcement to consider all factors when dealing with underage drinking. The current "one-size-fits-all" approach is not benefiting anyone involved.

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Materialism & Its Discontents

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ABSTRACT

With the ever-growing importance placed on material objects, consumerism as a social and cultural phenomenon has become an important area of research. The growing amount of research dealing with consumerism in modern capitalist societies has mainly dealt with the effects of materialism in regards to happiness. The main focus of this analysis was centered on desire and the perceived fulfillment of desire upon purchasing commodities and the perceived satisfaction individuals felt upon purchasing those commodities. The data from this study came from a survey distributed to students, which were analyzed using regression analysis. The data showed that even though consumers realize that their desires are not being fulfilled through the act of consumption, they are still more likely to have a feeling of emptiness when they are not able to purchase other goods that they desire. This paradoxical result is used to illustrate that the capitalist conception of desire—something that can be fulfilled by purchasing a commodity—is erroneous and leads to an endless construction of false needs and desires. The results from this study give us a better understanding of how capitalism manipulates desire in order to perpetuate consumerism.

Keywords: capitalism, Lacan, Marx, fetishism, materialism, desire

INTRODUCTION/THEORETICAL FRAMEWORK/LITERATURE REVIEW

Desire is an essential aspect of human nature that incessantly drives us onward and wills our existence. Inextricably bound to the development of our subjectivities, desire is a key informant of our actions, which perpetually negotiates a world of absent objects and emotions, always positioned vis-a-vis a notion of the 'lack'. In order for desire to continually exist, the objects of desire must remain in absentia, and it is in this absence that we construct fantasies for our desires. Felluga (2002) explains that.

In constructing our fantasy-version of reality, we establish coordinates for our desire; we situate both ourselves and our object of desire, as well as a relation between. Our object of desire (what Lacan terms the "objet petit a") is a way for us to establish coordinates for our own desire. To come too close to our object of desire threatens to uncover the lack that is, in fact, necessary for our desire to persist, so that, ultimately, desire is most interested

not in fully attaining the object of desire but in keeping our distance, thus allowing desire to persist. Because desire is articulated through fantasy, it is driven to some extent by its own impossibility (p. 1)

This Lacanian understanding of desire illuminates the shortcomings of the modern capitalist conception of desire: that desire is something that may be fulfilled through the act of attainment; in particular, the attainment of commodities. This erroneous, hegemonic conception of desire has been reified through a language that animates and sanctifies commodities as the ends of those desires. By manipulating desire in such a way, this falsification serves to perpetuate materialistic behavior by keeping subjects in a constant state of 'salivating' as the capitalist machine continually lays out what it is we are to desire, stripping us of our will and agency. It becomes clear then that our material desires are cultural constructions that we learn to internalize upon our entry into the linguistic, symbolic world.

The self as a 'significant form,' as a blend of experiences, values, and beliefs, combined in a particular way to create form through the formation of a self, has thus become a dissolution of experience and achievement as our phenomenological selves have been displaced by selves of objects—bodies of commodities.

For Nietzsche there is a kind of dissolution of the self. The reaction against oppressive structures is no longer done, for him, in the name of a "self" or an "I." On the contrary, it is as though the "self" and the "I" were accomplices of those structures" ('Nietzsche's Burst of Laughter', 2011, p. 1) The self, the consumer, has become an accomplice to the very structure, to the very state that is consuming it. Our subservience to commodities has reversed the dynamics of our relationship with the world of things: instead of being the masters of matter, the beings who write the nature of objects, we have become the slaves. The abandonment of a human 'significant form' is a consequence of the poverty of imaginative forces that have rendered the creative construction of the self obsolete, or, at the very least, unnecessary. This self as significant form, of a phenomenological being of experience, has been displaced by an algorithmic self that finds meaning (the negation of meaning) in the adherence to a capitalist symbolic order that propagates the manifestation of a self of negation through rational and mechanistic means. Our being thus finds itself positioned in strict categories. These constructed categorical selves—these selves that exclude the self—are developed apart from us by and through commodities. The nomadic nature of the self thus arises from a constant departure, a perpetual displacement from a point of origin (our self, our bodies).

To advance this idea of the self I will appropriate Zygmunt Bauman's

concept of 'the tourist'.

The tourist is on the move...He is everywhere he goes in, but nowhere of the place he is in...The tourist moves on purpose (or so he thinks). His movements are first of all 'in order to', and only secondarily (if at all) 'because of'...In the tourist's world, the strange is tame, domesticated, and no longer frightens; shocks come in a package deal with safety. This makes the world seem infinitely gentle, obedient to the tourist's wishes and whims, ready to oblige; but also a do-it-yourself world, pleasingly pliable, kneaded by the tourist's desire, made and remade with on purpose in mind: to excite, please and amuse (Bauman, 29-30)

The 21st century 'tourist' must not be thought of as someone who travels spatially, but a being that forever traverses the muddy waters of the void that is the capitalist symbolic order. This tourist takes up residency in the perpetual present, gorging the ready-made comforts of the modern world, and speaks in the dead tongue of commodities. Its language has undergone a metamorphosis: it wears the abrasive sensuality of objects on its fingertips.

While Bauman says that the world appears to the tourist as something which is "pleasingly pliable, kneaded by the tourist's desire," I argue that it is the tourist's desires which are kneaded by the world that seems "infinitely gentle." The hegemony of consumerism marks the shift from our natural desires to culturally constructed desires. Being that human desire is always a desire for something else, for what is lacking, desire can have no fixed object: "There is no object of desire, an object that could satisfy desire, only object-cause of desire: something that incarnates the lack and entails a promise of dealing with it" (Stavrakakis, 2002, p. 90). The discourse of advertisements manipulates this lack by mythologizing commodities, instilling in them a breadth of experiences and emotions that promise the consumer (the tourist) a navigable path to traverse the world of absence into the world of attainment. It is for this reason that I say the tourist of the 21st century no longer travels spatially, for it is the object-commodities that do all the traveling whilst we sit static, dejected in their absence, forever anticipating their presence.

The 21st century tourist, therefore, perpetually traverses the world of objects, navigating a reality of dead things which signify our displacement from the real, possessive of desires that are not only not our own, but also interlinked with and determined by the social relations of society and the power. To be complete, to satisfy our pleas for individuality and the construction of a subjectivity which is truly our own, we must possess, for possession in our modern society implies 'becoming whole', which presupposes a 'lack'—a

feeling that one is not completely oneself, that we must find bits our being in material reality, possess them, and thus bestow meaning upon ourselves. Nietzsche proclaimed that "possessions are usually diminished by possession," and this phenomena is nowhere more evident than in our modern capitalist society.

When framed within this theoretical background, it becomes clear that any analysis of materialism must transcend the vast amount of research that has simply sought to delineate a relationship between materialism and well-being. Traditional definitions of materialism have centered on individuals overestimating the importance of material goods to their overall happiness and life satisfaction (Flynn, Goldsmith & Kim, 2013; Belk, 1985). While I believe this definition of materialism to be slightly accurate, it does little to imply the psycho-social effects of materialism on the individual, nor does it incorporate the dialectical relationship between the state and the populace, which, together, reinvents and perpetuates consumption as the purpose of being. This hegemony of consumerism marks the shift from our natural desires to culturally constructed desires. Since human desire is always a desire for something else, for what is lacking, desire can have no fixed object. The discourse of advertisements manipulates this lack by mythologizing commodities, instilling in them a breadth of experiences and emotions that promise the consumer a navigable path to traverse the world of absence into the world of attainment. These discursive elements of advertisements have permeated the value system of western culture and are continually perpetuated in the socialization process (Ahuvia & Wong, 2002, p. 396). In studies done by both Burroughs and Rindfleisch (2002) and Norris and Larsen (2010), materialism has been shown to correlate positively with negative values such as hedonism and achievement, and correlates negatively with values associated with universalism and benevolence. This research, when coupled with research that illustrates a negative relationship between high materialism and happiness (Belk, 1985), helps portray a proliferating feeling of anomie.

This feeling of anomie is born of a deregulation of morality, which is symptomatic of unbridled production, a limitless market into which one is submerged without quite knowing one's place; an essence-less system which substitutes life for death in order to continue its continuous expansion. In this system, the fetishism of commodities is perpetuated through a dead analytical language that finds its basis in and through dead things (i.e. commodities).

Commodity fetishism is the misinterpretation of material goods as things which possess value in and of themselves; things that are endowed with mystical qualities and begin to rule over humans as if ordained by some natural law. Marx describes the idea of commodity fetishism by saying:

In order, therefore, to find an analogy, we must have recourse to the mist-enveloped regions of the religious world. In that world the productions of the human brain appear as independent beings endowed with life, and entering into relation both with one another and the human race. So it is in the world of commodities with the products of men's hands. This I call the Fetishism which attaches itself to the products of labor... (Marx, p.43).

In an object present where one feels a 'lack-of'—when an individual becomes aware of an absence—the ends of desire become manifest in the object which is not present. Materials are thus bestowed with mystical qualities and transcend the realm of sensuousness. Commodities become the bearers of meaning, fostering a pseudo-individuality that necessitates the surrender of the individual to a social formation, which propagates a world of dead symbols, language, and values. It is in this contextual framework that I will begin my analysis of materialism, further seeking elements of our current social condition, which ground us in this anomic, disenchanted state.

METHODOLOGY

The data used in this analysis was collected through an online survey I conducted, which asked respondents to answer 13 questions using a Likert scale (strongly disagree to strongly agree). The questions asked in the survey all pertained to aspects of materialism and required a mild to high degree of self-introspection on the part of the respondents in order to gauge their materialistic habits. The questions revolved around satisfaction with material goods, individuality and material goods, views on American consumption patterns, and the desire for material goods. My sample population included UW-Stout students, and the assumed age range was between 18 and 25, with the possibility of a few outliers. The reasoning behind choosing this demographic was because I was particularly interested in examining developing materialistic habits in educated, young adults. Most college-age students are exposed to copious amounts of advertisements, whether it is through television or their engagement with social media, and therefore they are an important demographic to analyze in order to understand materialism as a whole. The university's research clearinghouse provided the e-mail addresses of the 1,000 students, and all results were submitted anonymously, leaving no possibility for anyone to trace certain answers to particular individuals.

Of the 1,000 participants who received surveys, only 117 individuals completed the surveys. After I sent out the initial survey, I followed up each week for two weeks with reminders to complete the survey. Upon gathering the data, I performed a quantitative analysis in SPSS searching for relationships and interactions within the data to aid in formulating a cohesive argument in regards to the detrimental effects of materialism on society and the individual.

RESULTS & ANALYSIS

Through my analysis I found certain patterns of dissatisfaction with material goods, which provided paradoxical results. The main focus of my analysis was centered on desire: the perceived fulfillment of desire upon purchasing commodities and the perceived satisfaction individuals felt upon purchasing said commodities. Having framed my research around Lacan’s theory of desire, I was curious to see if this theorization would be reflected in the respondents’ answers. To explore these ideas I ran two linear regression models. The first model included a dependent variable corresponding to the survey question, “I often have a feeling of emptiness or disappointment when I am not able to purchase material goods that I desire,” with explanatory variables exploring impractical spending, how much the respondent desires other individuals’ materials, the respondents’ tendency to not feel that their desire was satisfied upon purchasing a material good, and their affinity for possessing unique materials.

Table 1 Regression statistics for effects of level of impractical spending, desire of others material goods, lack of satisfaction upon possession of material goods, & desire to possess unique goods on the feeling of emptiness when unable to purchase desired goods.

	1
Impractical Spending	.179**
Desire Others' Materials	.227***
Not Satisfied Upon Possession	.162*
Uniqueness	.031****
R ²	0.230***
df	3
N	117

*p<.10; **p<.05; ***p<.01, **** not significant two tailed tests

Source: Matt's Awesome Survey

Table 1 reveals that three of the explanatory variables were statistically significant at varying levels. The most interesting result shows that for every 1 unit increase in an individual realizing that their desire for a material good was not satisfied upon purchasing said good, they are .162 more likely to have a feeling of emptiness when they are not able to purchase other goods that they desire. This paradoxical result is easily framed within Lacan’s theory of desire. What this result reflects is that cultural desire, propagated by the capitalist system, is not realized in attainment. Despite the fact that

the fulfillment promised by commodities is not realized, individuals still feel a degree of disappointment when they are unable to further purchase commodities which promise the same fulfillment.

There are multiple explanations for this paradox, but the one I will put forth is that individuals are, in essence, 'consuming themselves'. Materialism, for many, provides an arena for forging an identity. The idea that one can forge an identity through the materials they possess presupposes that there are traits inherent in materials, and that, by possessing materials, those traits are then bestowed upon the possessor. This type of behavior is symptomatic of a materialistic hegemony wherein the values of materialism permeate into the consciousness of the citizens and are accepted as the guiding voices of action. Though these values are internalized by citizens and regarded as serving their best interest, it becomes clear that the current erroneous conception of desire is detrimental to the essence of the individual. Desire must necessarily remain unsatisfied because the ends of this desire lay not in the actual acquisition of a particular commodity, but in the perpetual attainment of the conceptualized sentiment or state of being, which guided the act of consumption and is instilled into that material which is consumed. Upon the acquisition of a particular commodity, it is from thereon a simple act of transference: the possessor seeks to instill the spirit of the commodity into him or herself. The folly here lies in a simple misconception: the commodity has no spirit, for it is a dead thing. The fetish value of the commodity is realized in the possession of a desired material: upon possession, the consumer realizes the disconnect between the object-cause of their desire (which is what they base their fantasies around), and the actual object that they attain. Here we see another paradox: in order for desire to persist, the object must remain in absentia because once the object is attained, all fantasy melts away and the consumer is left with a dead object unable and unwilling to satisfy their desire. It is this paradox, as I've mentioned, that capitalist and hegemonic advertising manipulates.

My second regression model includes a dependent variable which corresponds to my survey question, "I often desire other peoples materials such as cars, clothing and electronics," with explanatory variables exploring whether or not an individual's desire is satisfied upon purchasing a material good, the feeling of emptiness an individual has when they are not able to purchase a good that they desire, and individuals who state that they are always satisfied upon purchasing material goods.

TABLE 2

Table 12 Regression statistics for el
level of lack of satisfaction upon posse:
material goods, desire satisfied upon pu
of material goods, & desire unfulfilled
able to purchase material goods on how
an individual desires others' materials

Desire Satisfied Upon Purcha
Desire Unfulfilled
Not Satisfied Upon Possession
R ²
df
N
*p<.10, **p<.05, ***p<.01, **** not s
two tailed tests
Source: Matt's Awesome Survey

Table 2 illustrates that for every 1 unit increase in an individual finding that their desire was not satisfied upon purchasing a material good, they are .203 more likely to desire other individuals' material goods. This regression model again provides us with a bit of a paradox, and again reiterates Lacan's theory of desire. When an individual finds their desire unfulfilled, they desire the 'other'. Lacan believed that all humans desire in the 2nd degree: our desires are culturally constructed and we are taught what and how to desire. The rationale for desiring others' material goods can certainly play into the desire for social status, but also a false perception that leads the individual to attribute certain characteristics to materials that others own, which may lead to thoughts such as, "They are so happy with their new house and new car! If only..." These types of thoughts are common in individuals who are seeking out happiness through materials, though we can see that they are misattributing the others' happiness to material goods.

As we can see, both models illustrate a sort of perpetual-motion machine that constantly reiterates material goods as the ends of our desires. This type of desiring is formulated by and through advertisements that construct fantasies that do not align with reality, rather: they fetishize commodities. This materialist hegemony severely limits the sphere of agency for any given actor by creating algorithmic 'niches' which individuals are cast into. Thus, each person has given materials which are used to define their individuality, but really, the use of materials as a means of presenting oneself creates a shroud of inauthenticity around the individual because their 'self' is not constructed around anything real, but around dead, spiritless commodities. The

capitalist system is dependent on economic growth, and economic growth has become the mode by which we measure 'success' in America. The call for economic growth is therefore a call to consume, as consumption is necessary for growth. This call to consume is paradoxical because, as I said before, with the fetishism of commodities, consumers are essentially becoming the consumed: our desires are prescribed to us. I believe this research thus shows that this desire for materials is an erroneous attempt to construct a unique individuality within a vast, disenchanting socio-economic order. Modernity has presented us with a paradox: we have an inner desire to express ourselves, to be individualistic, yet, we embrace this desire by rejecting our own moral and aesthetic preferences in order to live a more comfortable existence by desiring the 'other'.

In summation, I think future research is needed to expand on the object-cause of desire and consumer perception of desire. I believe that a psychoanalytical approach to materialism will foster a deeper understanding of how hegemonic forces are internalized and externalized into consumptive behavior, which, ideally, will help in our quest to find ways to undermine the current capitalist system and its proliferation of materialism. Due to my small sample size and limited age group, I think future studies should also encompass a larger population in order to bring about more generalizable results.

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Plant Species Richness Determinants in Ephemeral Ponds and Permanent Wetlands

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ABSTRACT

Ephemeral ponds (EPs) are wetlands that dry seasonally and are common in the forests of northern Wisconsin. We examined relationships between several environmental factors and plant species richness (number of species) in 43 EPs and 14 permanent wetlands (PWs) located in the Chipewewa Moraine State Recreation Area. We used multiple linear regressions to identify significant relationships between environmental attributes and plant species richness. PWs had higher plant species richness than EPs, possibly due to their larger size and more stable hydrology. In EPs, chlorophyll-a was positively related to plant species richness, while pH and water depth were negatively related. In PWs, pH and SRP were strong negative predictors of plant species richness. Species richness may have been higher in low pH wetlands due to the addition of acid-loving species. High chlorophyll-a (algae) in EPs may have indicated a decrease in light limitation for vascular plants. In PWs, high SRP may have decreased species richness due to the dominance of competitive plant species. Plant species richness was significantly higher in wetlands dominated by dry hummock compared to wet pool/flat-type microtopography in both wetland types. The stable water levels in PWs make microtopographic variation more important for small-scale richness. Our results indicate that EPs may not be as important for vegetation conservation as PWs, and EPs may not be as susceptible to phosphorus pollution as PWs. With climate change causing less frequent but more intense precipitation events, more generalist species may increase in all types of wetlands, but especially EPs.

Keywords: Plant species richness, ephemeral ponds, wetlands

INTRODUCTION

Ephemeral ponds (EPs) are temporary wetlands that host a uniquely adapted flora and fauna. EPs are typically found in low forested areas that fill with water in the spring time and dry up sometime during the summer (Colburn, 2004). Although isolated from permanent water bodies and typically quite small, EPs still contain amphibians, including a variety of frogs and salamanders, as well as invertebrates and plants (Colburn, 2004). Drying prevents

fish colonization so that both amphibians and invertebrates can flourish. EPs have some species in common with permanent wetlands (PWs), but they also have their own distinct biota.

Few studies have been conducted on the effects of abiotic factors on plant community species richness (number of species) within ephemeral ponds. Abiotic factors are nonliving aspects of an environment, such as temperature, pH, salinity, or light. In general, wetland plant species richness can be affected by wetland microtopography (sub-meter variation in morphology and elevation), nutrient availability (i.e. N and P), levels of chlorophyll-a (a measure of algae growth), changes in pH (a measure of acidity) and conductivity (a measure of total ions) due to hydrosol inundation in the spring, and wetland area (Colburn, 2004). Although this study is limited to investigation of the within-wetland environment, dispersal, or the ability to move across the landscape, also likely affects species richness in these isolated wetlands (Boughton et al., 2010).

Wetland plant species richness tends to be positively correlated with surface area (Nicolet et al., 2004). Habitat patches of larger area tend to have more resources and niches than those of smaller area (Cain, Bowman, & Hacker, 2011). Because EPs tend to be small (Colburn 2004), we expected PWs to have higher plant species richness than ephemeral ponds. In addition, the alternating flood-desiccation cycle may provide a more challenging environment for plant growth in EPs.

Higher levels of available phosphorus (P) can be associated with greater species richness in wetlands because P is often a limiting nutrient in freshwater systems (Xu et al., 2007). However, elevated phosphorus may lead to eutrophication in freshwaters and an increase in algae production, which can be detrimental to aquatic plants by blocking sunlight (Khan & Ansari, 2005). Johnston and Brown (2013) found that chlorophyll-a, P, and conductivity were among significant variables used to distinguish plant community assemblages. At the wetland scale, we hypothesized that as P and chlorophyll-a increased, there would be a decrease in species richness due to light attenuation from algal competition. In relatively unpolluted systems, conductivity is often indicative of the nutrient status of the wetland; higher conductivity means more nutrient ions (phosphates, nitrates, and ammonium) are present. Therefore, we hypothesized that increased conductivity would also lead to decreased plant species richness.

Johnston and Brown (2013) found that pH was a significant factor affecting plant community composition. Furthermore, pH is a vital determinant of the variation found in wetland plant functional groups (Sekulová et al., 2011). With decreasing levels of pH (increasing acidity), nutrient availability

decreases and only plants which are able to obtain nutrients in other ways will thrive (Mitsch & Gosselink, 2007). In conjunction with our hypotheses regarding P and chlorophyll a, we hypothesized that pH and plant species richness will have a negative relationship; less acidic (higher pH) environments will be dominated by competitive plant species due to increased nutrient levels, thereby reducing wetland species richness.

Microtopographic features, such as small pools, logs, or hummocks, affect plant microhabitats (climate, sunlight, moisture availability, and organic matter) within wetlands and, in turn, influence species persistence. Studies on restored wetlands suggest that those with more microtopographic variation had higher species richness (Tweedy et al., 2001). Variation in microtopography leads to more niches being available for plant species and a wider variety of microenvironmental conditions. Plant diversity in created wetlands was positively related to tortuosity (amount of bend or twist) and elevation difference, both measures of microtopography (Moser, Ahn, & Noe, 2007). These studies support the hypothesis that microtopography (created by hummocks, logs, and stumps) will increase species richness in ephemeral ponds.

Water depth and hydroperiod (the duration of water in the wetland) also affect species richness. Shallower wetlands tend to have more species than deep wetlands (Cherry & Gough, 2006), perhaps due to more microtopographic variation. In addition, only specialized aquatic plant species can tolerate deep water environments (Mitsch & Gosselink, 2007). We hypothesized that wetland water depth would have a negative effect on plant species richness.

Although substantial work has been done on plant species richness-environment relationships in wetlands, little has been done in ephemeral ponds. We were particularly interested in the effects of environmental factors on plant species richness and whether EPs or PWs have higher species richness. Because little is known about EP plant communities, a multiple scale, multiple factor study was needed. Our study had multiple objectives. We aimed to determine 1) which type of wetland had higher species richness, permanent or ephemeral, 2) the important environmental predictors of plant species richness within EPs and PWs, and 3) the effects of microtopography on species richness at multiple scales.

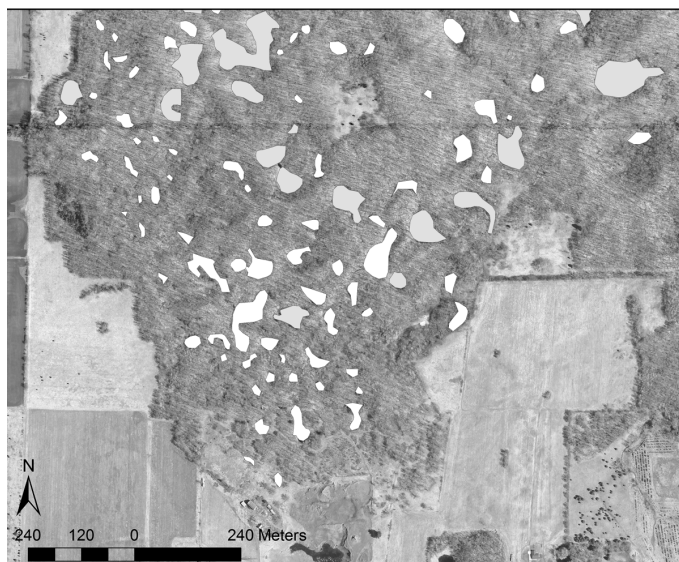
Methods

Study Site

This study was conducted in 57 wetlands (39 EPs and 18 PWs) in the 1,856 ha Chippewa Moraine State Recreation Area of Chippewa County,

WI, (Wisconsin DNR, 1990). The region is part of a terminal glacial moraine (Syverson, 2007), and contains numerous kettles that support wetlands of different sizes and depths (Figure 1). EPs ranged in size from 0.03 to 0.51 ha with a mean size of 0.09 ha. PWs ranged in size from 0.15 to 3.7 ha with a mean size of 1.6 ha. The region is heavily forested with mid-successional *Quercus* spp. (oak) and *Acer rubrum* (red maple).

FIGURE 1



Vegetation Sampling

Plant surveys were conducted using quadrats (1 m²) sampled in a stratified random manner within each wetland. Quadrat spacing ranged from 3 to 30 meters and transect spacing ranged from 5 to 30 meters. The number of plots per wetland varied from 9 to 47 (depending upon wetland size), with a mean of 18.2 plots per wetland. Transect lines were arranged perpendicular to the hydrologic gradient or in a ring around larger, deeper wetlands. Plant surveys were conducted during the latter part of the growing season from late July through early September, 2013. In northern latitudes, wetland plant sampling typically occurs during this time period in order to capture maximum plant growth and number of species in both EPs and PWs. Within each plot, all plant species were identified to species. The total species richness for each wetland was calculated as the total number of different species identified in the quadrats.

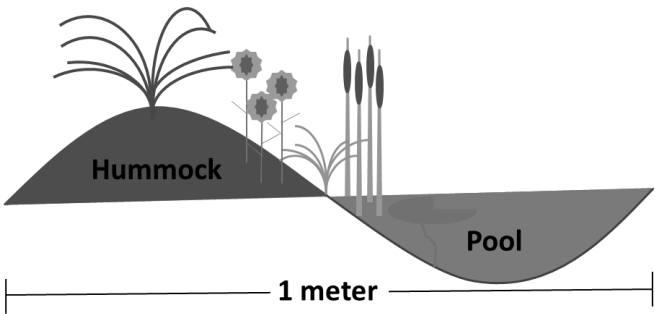
Environmental Sampling

In the same quadrats as the plant surveys, we sampled environmental variables, including woody, litter, moss and bare ground percent-cover. Microtopography was assessed using quadrat microtopographic score (QMS). QMS was categorized 0 through 5 (Table 1), according to topographic position, which included a gradient from high hummocks to pools (Figure 2).

TABLE 1

Quadrat Microtopographic	Structural Featured
Score	Represented
0	Pool
1	Flat
2	Low Hummock
3	Hummock
4	High Hummock
5	Stump

FIGURE 2



Canopy cover was measured using a convex spherical densitometer. Water depth, peat depth, litter depth, and litter type (deciduous or gram-inoid) data were also collected in each quadrat. Nutrient levels and water chemistry parameters were assessed four times per growing season between May and early August, 2013. Conductivity and pH data were collected using a field Oakton PCTestr 35® meter at water surface in the three different locations of each wetland. In the same locations, mid-depth water samples were collected and processed in the laboratory for chlorophyll-a, total and soluble reactive phosphorus (SRP), ammonium, and nitrate concentrations. Samples for chlorophyll determination were filtered onto glass fiber filters (Gelman

A/E; 2 μm nominal pore size) and extracted in 90% alkaline acetone. Viable chlorophyll and pheopigment concentrations estimated used the trichromatic equation (APHA 1999). Total and soluble reactive phosphorus were also processed according to APHA (1999) protocols, and nitrate and ammonium were sampled using ion-specific probes.

ANALYSIS

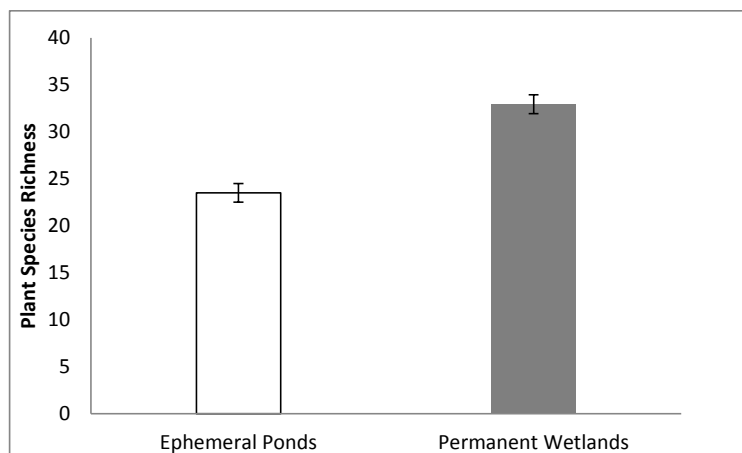
We used Welch's t-test to compare plant species richness between PWs and EPs. Stepwise multiple linear regression was used to narrow down the suite of environmental variables that affect species richness, and then multiple linear regression was used to create models. We conducted regression analyses for EPs and PWs separately in order to determine whether the importance of different factors differed between the two wetland types. Linear regressions modeling the effects of microtopography on species richness were conducted at both the quadrat scale and the wetland scales. All statistical tests were completed using Minitab (2010).

RESULTS

Richness in Ephemeral Ponds versus Permanent Wetlands

PWs had a significantly higher mean richness of 32.9 (SE = 2.0) species, while EPs had 23.5 species (SE = 1.0, Figure 3). These means were significantly different ($P = 0.001$, $t = 3.32$, $df = 29$).

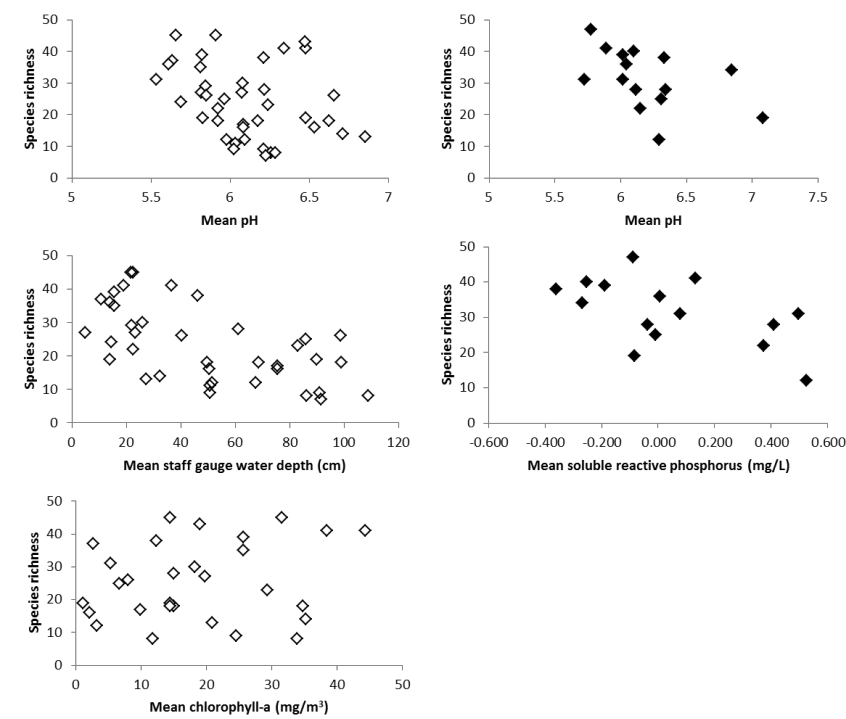
FIGURE 3



Predictors of Species Richness in Ephemeral Ponds and Permanent Wetlands

The best model for predicting species richness in EPs was richness = 142 - 18.4 pH + 0.342 chl-a - 0.207 depth (P < 0.001, F3,23 = 11.95, R2 = 60.9%). The best model for predicting species richness in PWs was richness = 139 - 17.2 pH - 24.2 SRP (P < 0.001, F2,12 = 16.66, R2 = 73.5%). pH was the only variable that significantly affected species richness in both EPs and PWs. Note that peat depth was significantly correlated with pH (r = -0.362, P = 0.006). In EPs, chlorophyll-a and water depth were also important. In PWs, SRP was also important (Figure 4). Although we measured both nitrate and ammonium forms of nitrogen, neither of these were important predictors for plant species richness in either EPs or PWs.

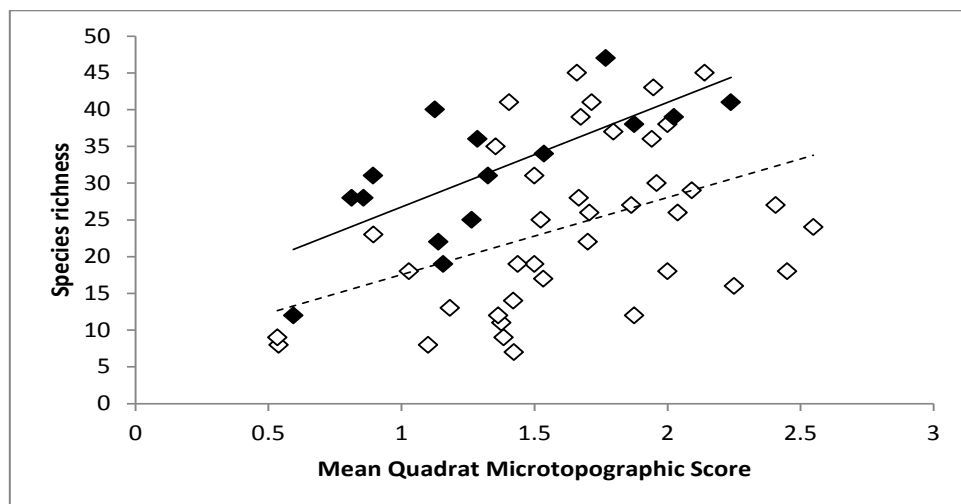
FIGURE 4



Microtopography Effects on Species Richness at Multiple Scales
The relationship between mean QMS and species richness among both EPs and PWs was significant and positive (in EPs, P = 0.007, richness = 7.0 + 10.5QMSmean, F1,37 = 8.03, R2 = 17.8%; in PWs, P = 0.002, richness = 12.5 + 14.2QMSmean, F1,13 = 14.44, R2 = 52.6%). There was a similar

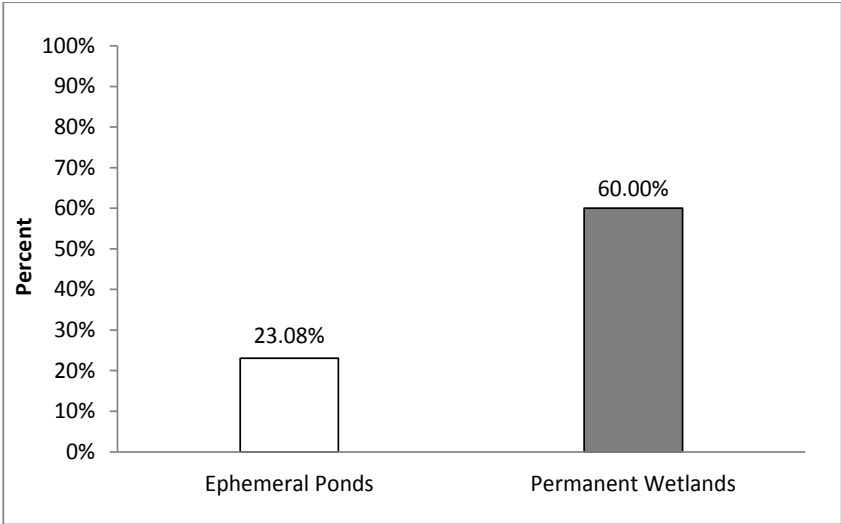
relationship between QMS and species richness in both wetland types, as indicated by a similar slope to the regression models (Figure 5), although the QMS explained more species richness variability in PWs than in EPs.

FIGURE 5



Within-wetland QMS showed significant positive relationships with plant species richness in 37% of all wetlands. A higher proportion of PWs compared to EPs had significant within-wetland relationships between QMS and richness (Fisher's Exact Test: $P = 0.022$, Figure 6).

FIGURE 6



SUMMARY

While QMS had significant positive relationships with species richness in both EPs and PWs, these relationships were stronger in the PWs. In addition, QMS was more important to species richness within PWs than EPs. The only environmental variable that was a significant predictor of species richness in both EPs and PWs was pH (Table 2).

TABLE 2

Factor	Effect on EPs	Effect on PWs
QMS (among wetlands)	Significant positive	Significant positive
QMS (within wetlands)	Significant positive less often	Significant positive more often
Chlorophyll-a	Significant positive	n.s.
pH	Significant negative	Significant negative
SRP	n.s.	Significant negative
Water Depth	Significant negative	n.s.

Discussion: Richness relationships between EPs and PWs.

PWs had higher mean plant species richness than EPs. This result was likely due to the smaller size of the EPs. Alternatively, their more ex-

treme environmental conditions may cause lower species richness. Generalist species may be the only plants that can tolerate the extreme hydrologic fluctuations in EPs. In an experimental study by Warwick and Brock (2003), amphibious plant species were found in all types of water regimes, but submerged and terrestrial plants only grew under specific conditions. Terrestrial plants did not grow well when subjected to long periods of submergence, while aquatic plants cannot tolerate prolonged desiccation (Warwick and Brock 2003). PWs may host all types of plants, whereas EPs host only tolerant plant species (i.e., amphibious generalist species). EPs may provide a poor habitat for submersed plants due to annual drying, as well as a poor habitat for terrestrial plants that germinate early in the spring before drying occurs.

Environment-richness relationships

The negative relationship observed between richness and pH for both EPs and PWs in this study may be due to pH effects or it may be a coincidental correlation. More flooded, deep ponds may have a higher pH due to dilution of hydrogen ions. Our study demonstrated a decrease in species richness with increased water depth, and these more pH-neutral ponds may have fewer plants because they are deeper water, not due to any specific effects of pH. A real effect of pH may have been seen because wetlands with lower pH had more peat accumulation, leading to the addition of more acid-loving species to the assemblages of plants.

Previous studies have reported positive feedback between SRP and chlorophyll-a in fresh waters, as P-limited algal growth increases with higher phosphorus concentrations (Mitsch & Gosselink, 2007). In the PWs from this study, SRP had a significant negative relationship with species richness. Phosphorus can limit rare species in wetlands (Venterink et al., 2003). The majority of wetlands in our research area had abundant phosphorus for plant growth. High phosphorus levels may encourage the growth of competitive species and discourage specialist, stress tolerant species (Güsewell et al., 2005).

In EPs, a significant positive relationship was observed between chlorophyll-a and species richness. This finding is atypical for freshwater lakes (Khan & Ansari, 2005), but may be explained by the characteristics of our particular system of wetlands. Chlorophyll-a increases with light and nutrient availability (Mitsch & Gosselink, 2007), which may be limiting in our system of EPs. The ponds are in a heavily forested setting and many have high canopy cover. Similar to water depth, light may not be limiting in PWs due to their larger size and lower canopy cover.

Water depth predicted richness in EPs only. Similar to Cherry and

Gough (2006), we found that mean seasonal water depth was significantly negatively correlated with plant species richness. The lack of relationship in PWs may be due to their lack of seasonal drying and the establishment and persistence of submerged and amphibious plants in these wetlands. For a deep-water-adapted plant to colonize and establish in an EP, we speculate that the pond would need to be flooded for several years. It is also possible that water depth indirectly affects plant species richness through other factors. For example, deeper ponds may dilute pH and SRP, provide a longer water column for light attenuation to occur, and would need more dramatically variable microtopography in order to create microhabitats of dry and wet areas.

Like other studies, we found that microtopography increased species richness (Tweedy et al., 2001; Okland et al., 2008). Microtopography creates a variety of microenvironments in which a variety of different plants can survive. A mixture of dry and wet areas in a wetland provides places in which plant species with a variety of life strategies (terrestrial, aquatic, or amphibious) can germinate and grow (Vivian-Smith, 1997). Due to light attenuation and gas exchange limitations, submerged aquatic plants need specialized adaptations (Mitsch and Gosselink 2007). At a certain depth, amphibious plants no longer survive, and only submerged plants remain. In our study, the deepest areas of ponds had no emergent plants, and occasionally were devoid of vegetation. Microtopography is critical for providing germination safe sites in PWs, but may not be as important within EPs due to their fluctuating water levels that provide a variety of habitats. PWs may depend more on microtopography to increase plant richness because their water levels do not fluctuate as much.

Implications and future directions

From the perspective of vegetation quality, EPs may not be as important to conserve as PWs. Their real value is likely in sustaining macro-invertebrate and amphibian populations. Harsh conditions in EPs may allow for only generalist, "weedy" plant species to persist. Richer plant communities may not be as viable in EPs due to interval drying and flooding. However, because EPs did not show a significant relationship with SRP, they may have a higher conservation value where flood mitigation is desired and fertilizer runoff from agriculture is present. The nature of EPs provides flood water catchments in the spring, but their natural plant communities are less affected by high phosphorus levels.

PWs' significant negative relationship with both pH and SRP may make them more susceptible to effects from agricultural runoff. For this reason, PWs in areas with less surrounding agricultural land should have a

higher conservation value. In areas where agricultural runoff surrounds PWs, EPs could serve as a buffer to nutrient enrichment.

The flashy weather events predicted to increase with current climate change (IPCC, 2013) may lead to increased dominance of generalist species in EPs. It may also lead to generalist species invasion around the fluctuating edges in PWs. More intense but infrequent precipitation may cause more area in the wetlands to be suitable only for generalist species. Changes in weather patterns and consequently the hydrology of these systems may cause their plant community assemblages to change.

Future research will continue to examine plant species richness and how it is affected by additional factors, such as hydroperiod length or regional topography. There may also be plant species that are unique to EPs. The Chippewa Moraine Ephemeral Ponds Project is an ongoing five-year study. Field research, along with experimental research, is needed to more closely understand the nature of these systems. It is likely that a combination of multiple factors has strong relationships with plant species richness.

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Photopolymerization of Methylmethacrylate: An Inexpensive, Open-Source Approach for the Undergraduate Lab

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ABSTRACT

Light-cured polymer resins are plastics that harden after exposure to UV or visible light. The market for UV resins is expanding due to their environmental and economic benefits over conventional polymers. Using light to cure the resin allows the raw monomer to be formulated and delivered to a substrate with little to no solvents or volatile organic compounds (VOCs). Traditional industrial production of photocure products utilizes mercury vapor lamps that require a constant flow of water to prevent the light source from overheating. This research details an apparatus fabricated with open-source electronics to cure and control the polymerization process. The solid-state LED source is compact, inexpensive, customizable, and provides high-intensity (250mW/cm² per LED) irradiation that is easily directed. These features make it readily deployable in an undergraduate or research setting for small-scale experimental use. Proof of concept is demonstrated through a photoinitiator system formulated with Michler's ketone (4,4'-bis(dimethylaminobenzophenone) and benzophenone to achieve 97% conversion of methyl methacrylate into a high molecular weight resin. The effect of other photosensitizers and hydrogen donors on cure speed, molecular weight, yellowing and monomer conversion are reported for similar resins.

INTRODUCTION

Photocure polymers are a type of specialty plastic product that uses visible or ultraviolet (UV) light to cure a liquid mixture into a solid. They serve a variety of applications as adhesives and inks for the printing industry and other technology sectors such as electronics fabrication (lithography), dental fillings, coatings, paints and packaging. The economic and environmental benefits have increased interest in both academia and industry. Resins can be made to cure within seconds, allowing roll-to-roll processing at high speeds. Formulations with little or no volatile organic compounds (VOCs) produce less waste than conventional coatings. UV radiation is non-ionizing and presents no danger aside from prolonged skin and eye exposure (Yagci, Jockusch & Turro 2010).

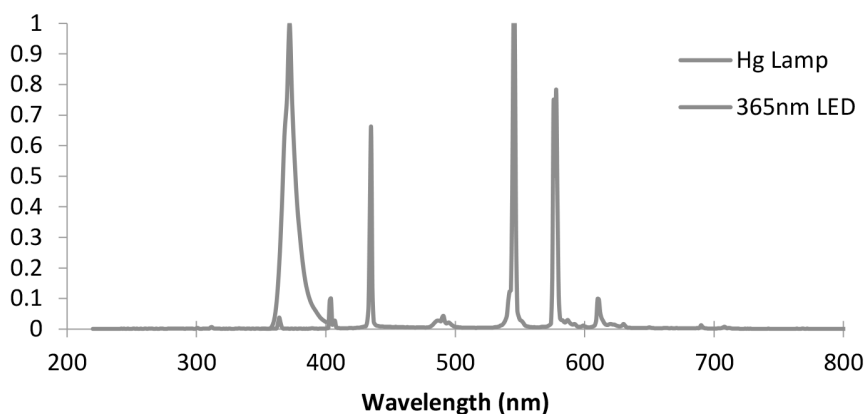
Commercial production typically utilizes mercury vapor lamps,

which provide high UV output at the cost of low energy efficiency. They produce heat and require a constant flow of water to cool them. Figure 1 shows the normalized output lines of a medium-pressure mercury vapor lamp in blue and a 365 nm light-emitting diode in red. Much of the output of the mercury lamp is lower energy, visible light that is outside of the UV region (>400 nm). Additionally, the light from gas discharge lamps propagates in all directions, necessitating shielding for safety and expensive quartz optics to direct and focus the light.

In contrast, light-emitting diodes (LEDs) provide a narrow emission band (shown as the red peak in Figure 1) and offer higher energy efficiency. As a result, the wasteful heat is reduced and can be managed through a passive heat sink, making active water-cooling unnecessary. The efficiency, however, comes at the cost of sensitivity; the lifetime of LEDs is significantly decreased if operated at a high temperature. LEDs are effectively a point source that can easily be harnessed and pointed at the target without secondary optics. Until recently, ultraviolet LEDs were costly and limited in emission and power, but this has changed and high-power (>1 W) LEDs are readily available in 365, 395 and 405 nm varieties.

FIGURE 1

Emission Spectra of UV Sources



Detailed in this article is the fabrication of a UV photochemical reactor driven by an open-source microcontroller and off-the-shelf electronic components. Functionality of the reactor system is illustrated by the development of a UV-cured poly(methyl methacrylate) coating based off a class of photoinitiators called alkylaminobenzophenones.

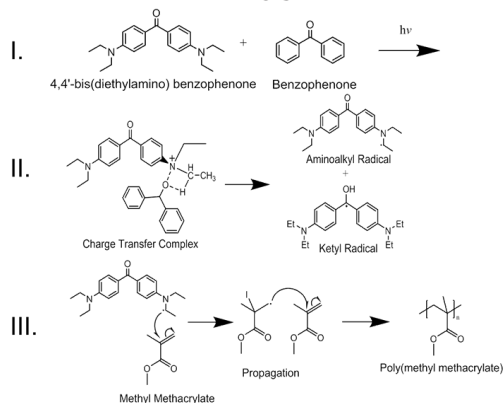
Photoinitiator Chemistry

Photoinitiators are molecules that absorb light, that become “excited” and undergo a series of processes to transfer energy to the monomer to initiate the polymerization. Photoreactions are complex processes that can take many routes, some leading to undesirable side products that decrease efficiency and hinder chain growth as reported by McGinniss, Provder, Kuo and Gallopo (1978). The discrete emission of LEDs presents a unique problem in formulation, and initiators must be selected to match the emission of the LED.

In an ideal photopolymerization process, the excited initiator forms a radical that attacks and breaks a double bond on the monomer. Radicals are highly reactive species that are unstable, short-lived (on the order of microseconds) and sensitive to oxygen and moisture (Wamser, Hammond, Chang & Baylor, 1970).

This radical then attacks the double bond of another monomer and forms a single bond with it. The radical continues to be passed, forming single bonds between monomers, until termination or quenching occurs and the radical becomes unreactive, as shown in Figure 2.

FIGURE 2



The reaction caused by the excitation of the photoinitiator can take the form of a molecular cleavage yielding free radicals (a type I mechanism), or a hydrogen-abstraction process (a type II mechanism). Each mechanism has different advantages as explained by Green (2010), but the present work focuses on a well-established class of Type II initiators, alkylaminobenzophenones, chiefly Michler's Ketone (referred to as MK or 4,4'-bis(N,N-dimethylamino) benzophenone)) and its ethyl derivative, BDEABP. MK and BDEABP were selected as the initiators for study because they have a high absorption in the 365 nm region, although other initiators are active in

this region. The mechanisms of MK/BDEABP have been thoroughly studied elsewhere (McGinniss, 1978). Benzophenone is inexpensive and can be used in high concentrations because it is readily soluble in MMA and absorbs at 230-260 nm. Light at this wavelength is less penetrating, which provides good surface cure. The disadvantage is that its low molecular weight makes it prone to migration that produces a distinct odor (Green, 2010).

Experimental Methodology

Micheler's Ketone (MK), 4'-bis(dimethylamino) benzophenone and its ethyl derivative, BDEABP were obtained from Fischer Scientific. 3,5-N,N-Tetramethylaniline (TMA) was purchased from TCI Corporation. Benzophenone (BP) and tris(trimethyl silyl) silane (TTMSS) was obtained from Sigma Aldrich. All chemicals were used without further purification. Polymerizations were performed in a glass scintillation vial with only monomer and photoinitiator(s) or in a solution with tetrahydrofuran (THF) or toluene. Scintillation vials were selected for the reactions because of their low cost. They are effectively single-use glassware; the polymer hardens in the container and is difficult to remove and clean even with aggressive solvents. Before reacting, the headspace in the vial was purged with N₂ then quickly sealed. To calculate the yield, a gravimetric method was employed. The unreacted, volatile components were evaporated from the vial in a furnace at 60°C under a reduced pressure of 7.6 mmHg. All yields are determined gravimetrically. A control experiment was performed by charging a vial with 10mL MMA, 4.8 % BDEABP and 4.8% BP, flushing with N₂ then leaving the capped vial on a lab bench under ambient conditions for 2 months. Gel-permeation chromatography (GPC) samples were prepared at a concentration of 10 mg/mL of dried product dissolved in THF. A Waters GPC fitted with a Styragel column was used for the analysis and calibrated with polystyrene standards. The light intensity at 365 nm was calibrated using a G&R labs Model 202 UV intensity meter and a distance scale marked on a ring stand.

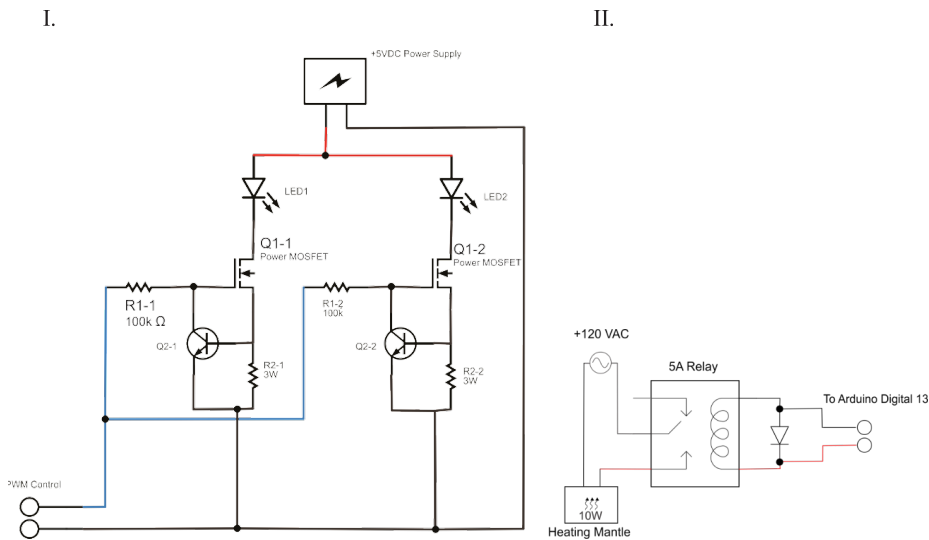
Electronics and Fabrication

The Arduino microcontroller serves as the platform for the radiation source, and was chosen because of its flexibility, ease of programming, and customizability. The ultraviolet source was designed using commercially available 3 Watt 365 nm UV LEDs and heat sinks (Mouser Electronics) powered by a 5Volt/5Amp supply (TDK Lambda).

A circuit to interface LEDs to a power supply to microcontroller is presented in Figure 3-I. The signal from the microcontroller is amplified by a small general-purpose NPN transistor, which activates an N-channel FET that

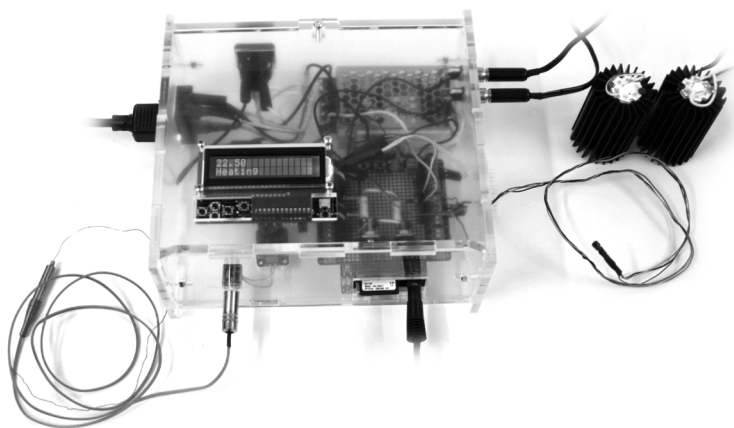
can switch the 700 mA load of the LED. Two of these circuits in parallel were assembled on a proto-shield from Sparkfun Electronics. Screw terminals on the proto-shield facilitate simple reconfiguration. A heating control for a 120 Volt AC heating device was fabricated using a low-power coil Omron 5 V relay rated for switching 5 A at 120 VAC. As shown in Figure 3-II, the relay is connected to a pass-through outlet, so any heating or cooling device up to 500 W can be used in this configuration. A freewheeling diode is placed across the relay to dissipate power from the coil after switching and prevent it from damaging the microcontroller. A prefabricated thermocouple board with a built-in MAX 31855 amplifier chip is used to monitor the temperature, and can be called at any point in the program.

FIGURE 3



A 16x2 character LCD from Adafruit is the basis for the user interface, and provides a directional keypad in addition to the multi-color backlight display. The LCD shield uses the i2c (inter-integrated circuit) protocol for communication, which reduces the amount of pins required to control the LCD and RGB backlight from 9 and also adds a directional keypad and select button. The electronics were housed in a laser-cut acrylic enclosure using the UW-Stout FABLAB's Epilog Fusion laser.

IMAGE 1



Programming

The program was written using the Arduino IDE (Arduino, n.d.). Add-ons called libraries are used in the program using the `#include`. The program has three main parts: `setup`, `loop`, and `end`. The `setup` initializes variables such as pin assignments. The `loop` is the heart of the program and contains the commands to control heating, irradiation time, and intensity. Within the main loop, LEDs are controlled with a pulse width modulation (PWM) signal generated by the `analogWrite` function. A value from 0-255 controls the duty cycle of the LED.

An AC heating device (such as a hotplate) can be controlled using a pass-through circuit connected to a relay. A simple `if..else` statement is used to control the temperature, which compares the set temperature to an average of 10 samples. The Arduino is also capable of more advanced options such as proportional-integral-differential (PID) control if precision temperature control is required. Adjustment of the temperature set point and duty cycle of the light source is accomplished by using the buttons on the LCD shield in an `if` statement with conditions that limit the values appropriately. The new value is then briefly displayed on the LCD before returning to the main loop. A timer to turn the LEDs on and off is incorporated by using a timer library, a long variable that runs a “done” loop after the set time has elapsed, which simply turns off the light source and relay.

The Adafruit data-logging shield contains an SD card slot and real time clock, which can log data in real time (opposed to relative time stored in the Arduino) to a file that can be processed later in any spreadsheet program.

RESULTS

Initial experiments were performed using styrene, which showed almost no reactivity to the initiator, so MMA was chosen for the study. Similar experiments (Green, McGinniss) confirm the current initiator system is not reactive with styrene or monomers with a low energy ground state and yields were very low (<15%) for styrene. Detailed results not included for this reason.

Experimentally determining the most efficient combination and relative proportions of initiators for polymerization of MMA was the main objective of this study, which was obtained by starting at relatively high (5% wt) amounts working down and increasing the ratio of benzophenone to Michler's Ketone/BDEABP dissolved in MMA. Concentrations of 0.16-5.00% weight initiator and 0.58-5.05% benzophenone were used, and the best properties (i.e. low total mass and high yield) were achieved at relatively small amounts of initiator: 0.3 weight % BDEABP to 1.88 weight %BP, approximately a 1:6 ratio. Results are shown in Table 1. The control sample that was allowed to react under ambient conditions with no high-intensity irradiation for two months yielded 67.3% conversion. In addition, the experimental source was compared to a commercial medium-pressure mercury (Hg) vapor lamp (Ace Glass Co.). Compared to the LEDs, the measured intensity of the vapor lamp was less than a single LED lamp at 365 nm. To ascertain the effect of decreased intensity and the presence of other wavelengths of light provided by the Hg vapor lamp on the polymerization, two samples were prepared with the same composition, one irradiated by the Hg vapor lamp and the other by the LEDs for 1 hour. The LED irradiated sample yielded 96% conversion compared to 88% for the Hg vapor illuminated sample, as shown in bottom rows of Table 1.

TABLE 1

Initiator Ratio (BDEABP:BP)	Weight % BDEABP	Weight % BP	Total Weight % Initiator	% Conversion
4:1	4.04	1.01	5.05	52.3
2:1	4.1	4.5	8.6	10.1
1:1	4.45	4.49	8.94	95.0
1:1	4.69	4.71	9.4	12.5
1:2	1.04	2.06	3.1	27.2
1:3	0.3	1.88	2.18	96.5
1:1 (Control, No UV)	4.81	4.81	9.62	67.3
1:1 (LED Control)	2.53	2.53	5.06	95.8
1:1(Hg Vapor Control)	2.53	2.53	5.06	87.7

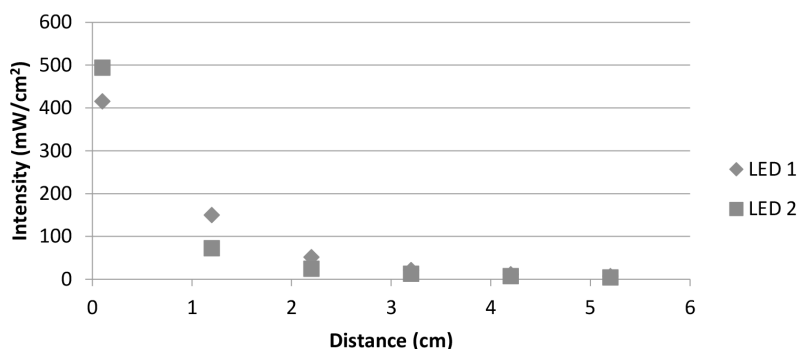
The viscosity of the samples varied dramatically with the percent conversion, as expected. Samples with low conversion were water-like, while the samples that went to near completion were difficult to remove from the

vial. After irradiation, it was observed that some of the reaction mixtures still remained water-like. After sitting overnight (without exposure to air), additional polymerization could occur and the mixture would “set” and form a highly viscous gel. The mechanism of this “living” phenomena is elusive, and a proper treatment is beyond the scope of this work. The optimal irradiation time for polymerization was determined by varying the irradiation time (from 15 minutes to 13 hours) and visually monitoring the reactor. Decomposition of the initiator occurs within minutes of irradiation. The reaction mixture changes from colorless to bright yellow quickly, long before a change in viscosity is noticeable. From these observations, it was determined that a 1 hour irradiation period is sufficient to break down the initiator. The high molar absorption of MK/BDEABP leads to yellowing even in low concentrations. Because the absorption is very high, yellowing could not directly measured and correlated with radical yield or conversion.

The measured intensity as shown in Figure 4 was 415 mW/cm² and 494 mW/cm² for the individual LEDs at 1mm from the source, which decays exponentially as the distance increases.

FIGURE 4

Intensity vs. Distance



Obtaining a high molecular weight polymer is often difficult with photoinitiated systems, as reported by McGinniss et al. (1978). Generally many radicals result in short polymer chains due to radical termination by combination. The addition of benzophenone was found to significantly decrease the molecular weight of the polymer. Raw chromatograms presented in Figure 5 and summary data in Table 2 show this trend. For the polymer produced without benzophenone, a bimodal distribution was observed, possibly due to competing mechanisms of radical formation or chain growth.

FIGURE 5

Chromatograms of P(MMA) in THF

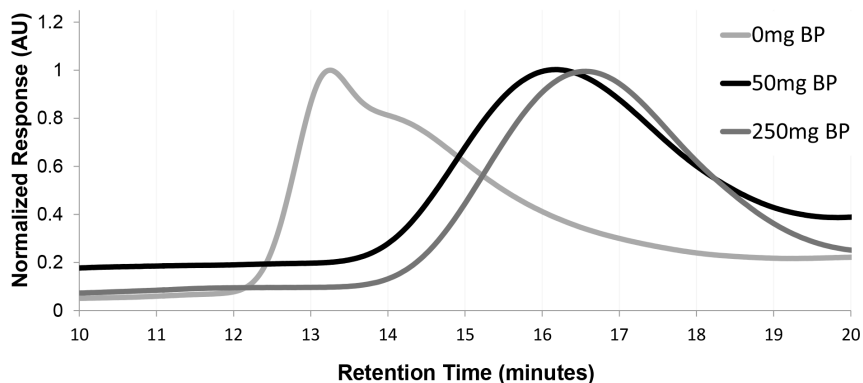
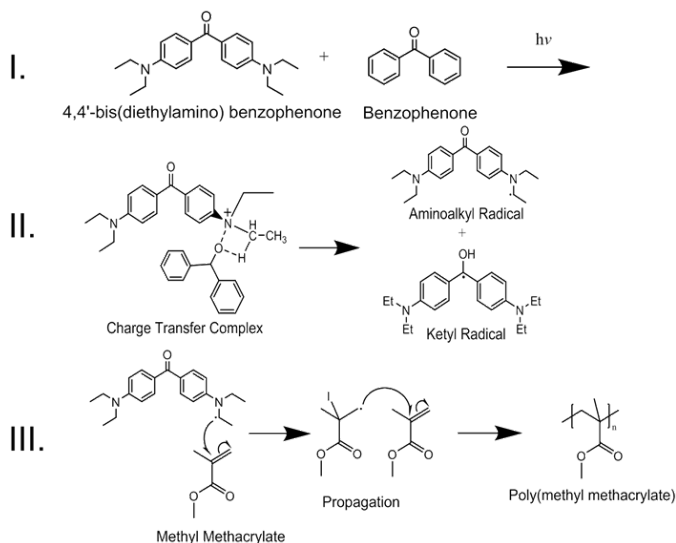
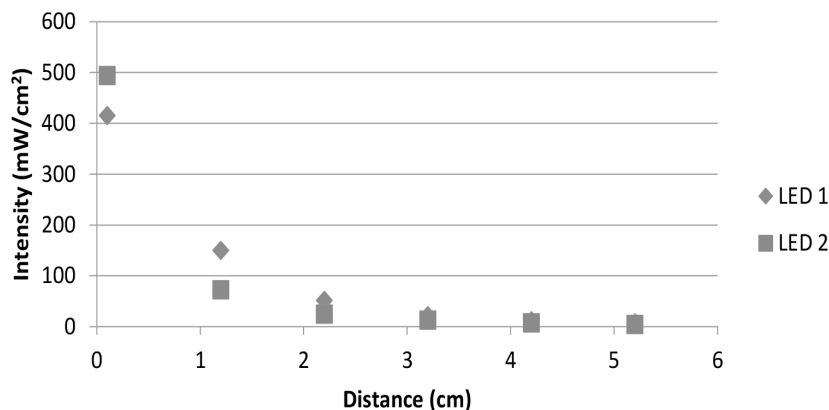


TABLE 2



Polymerizations were also attempted in two different types of solvents, THF (which is polar) and toluene (non-polar). The mixture of 50 % (v/v) solvent and monomer assumes that initiator volume is negligible. All components were readily miscible. The initiator loadings of these experiments are summarized in Table 3 (p.139) for THF and Table 4 for toluene, respectively. Neither THF nor toluene improved the yield compared to the control experiment.

TABLE 4
Intensity vs. Distance



However, once dried, the high-yield polymers produced without solvent exhibit high resistance to THF and Toluene. After addition of solvent, the solution remained biphasic for several days. These properties and GPC data confirm that the polymer has a high molecular weight, which varies significantly from MK/BDEABP acrylate systems studied elsewhere. Oxygen gas in the atmosphere causes quenching of radicals, thereby decreasing the yield. This effect was proven by performing an experiment with the vial open to the atmosphere and comparing with a control flushed with nitrogen. The formation of dark amber byproducts was observed in the vial open to the atmosphere, and the reaction mixture remained water-like in viscosity, indicating a low yield. A study performed by Lalevee et al. (2008) reports that the addition of TTMSS increases yield under air and impart hydrophobic properties to the resulting polymer, but these effects were not observed and the yield was still very low. Tetramethylaniline has also been reported by Schroeder, Asmussen, Cook and Vallo (2011) as an effective hydrogen donor, but did not significantly affect the yield even in amounts up to 1 wt%.

DISCUSSION

Despite the immediate yellowing, some samples did not reach maximum completion immediately after irradiation. Instead, the reaction mixture hardened overnight when the vial was left capped. This suggests that the polymerization may be "living," meaning that polymerization continues even though no new radicals are being formed. The full mechanism behind this phenomenon is not fully understood, but would explain the high molecular weight obtained. Conversion appears to be linear with time of irradiation. As

reported by Schroeder et al (2011), the rate of photolysis is independent of molecular mobility in a highly viscous or gelled medium. This effect contributes to the rate of initiation and may not hold true for the rate of polymerization, and the most probable explanation for the observed kinetics is that radicals and monomers are physically separated by the highly viscous reaction medium. Thus, the rate of the polymerization is effectively limited by the diffusion of radicals/monomer through the mixture. Benzophenone functions as an excellent sensitizer, and drastically increases the efficiency of both MK and BDEABP. Benzophenone is widely used in perfumery, but its low molecular weight makes it prone to migrate from the polymer matrix, since it is not incorporated directly onto the polymer chain (Green, 2010). This means that even after curing, a recognizable odor is present. Due to the aforementioned reasons, Type II systems with Michler's ketone are becoming less popular in industrial formulations, due to suspected carcinogenicity and the development of better photoinitiators. It has a high molar absorption coefficient (McGinniss et al., 1978) that results in yellowing and screening effect even in concentrations as low as 0.16% by weight. Since the triplet lifetime of the initiator is relatively long, quenching is more likely to occur than in type I systems (Green, 2010). For this reason, type II systems are inherently harder to formulate effectively. In a typical industrial coating application, raw monomers are rarely used to formulate coatings due to their volatility. Rather, oligomeric or "pre-polymerized" mixtures are delivered then fully cured with a photoinitiator. However, this study shows that raw monomer is able to be polymerized in bulk or with some solvent to make a fully-cured high molecular weight polymer.

The cost of the photocure system built in this study is much lower than commercial systems. The commercial reactor used in this study costs approximately \$1,200, while all of the components of the fabricated reactor totaled less than \$400. The Arduino and other open-source microcontrollers are an attractive option for deployment in undergraduate research settings, due to the cost and customizability. For students, they provide an insight into the fundamental aspects of instrumentation in the chemistry lab and an opportunity to design, build, and optimize a system.

CONCLUSION

An apparatus for photopolymerization studies was fabricated using an open-source Arduino microcontroller and off-the-shelf electronics. The solid-state LED source is compact, inexpensive, customizable, and provides high-intensity (250 mW/cm² per LED) irradiation that is easily directed. Photocure methyl methacrylate resins were formulated with Michler's Ketone and its ethyl derivative, BDEABP, then polymerized in bulk or solution. The effectiveness of MK/BDEABP can be improved by addition of benzophenone, a low-cost ketone. Various concentrations and proportions of initiators were used and the most effective concentration was determined to be 1:6 ratio of BDEABP to BP, which when combined composed 2 weight% of the reactants and yielded 96.5% conversion. Percent conversion was higher than reported in similar studies published elsewhere. The molecular weight of the polymer was determined using gel-permeation chromatography. Molecular weight was also found to significantly decrease with the addition of benzophenone. The cure speed and yellowing are significant drawbacks to the present system. Furthermore, exposure to oxygen significantly reduces yield and increases undesirable byproducts. Nonetheless, the feasibility of attaining a high-yield, high-molecular weight resin was demonstrated with bulk polymerization from raw monomer in a low-cost system that is easily deployable in an undergraduate setting.

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Post-Materialism and Environmental Values in Developed vs. Semi-Developing Countries: Analysis of Argentina and United States using the World Values Survey

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ABSTRACT

The environment feeds our everyday needs, desires, and global growth. If we are to make our relationship with nature sustainable we need to know who values rebuilding the natural environment that is crumbling on a global scale. This research focuses on post-materialistic values and their connection to protecting the environment. Who believes that improving the environment is more important than economic growth and creating jobs? "Who" is defined in this study in two ways: first, focusing on developed countries versus semi-developing countries, and second, focusing on individuals' post-materialist values versus materialist values. Previous research shows that people in developing countries place less value on post-materialist issues like protecting the environment compared to those in developed countries. This article argues that there is disputable difference of post-materialistic values, specifically in environmental values, between developing countries and developed countries. Findings here show that semi-developing countries may actually care more for environmental protection than economic growth.

Keywords: Develop, Developing, Semi-developing, Post-Materialism, Environmental Values, Argentina, United States

As a citizen in the United States, I see a strong emphasis on protecting the sustainable use of our environment every day. Upon living in Argentina for several months as part of a study abroad experience, it appeared to me that environmentalism as I knew it was nonexistent. In Argentina one is not shunned for lacking personal environmental improvement efforts. From the outsider's perspective I felt that Argentinians do not value environmental protection in the slightest. This follows what one might predict about the "luxury" of worrying about the environment that can only be found in developed countries, like the U.S. Meanwhile, developing countries must worry about more immediate interests, like an economy that provides jobs to sustain people's basic livelihoods. However, since one person's experience is very limited compared to a systematic, large scale analysis, I chose to investigate whether my impression of environmental values in Argentina and the U.S. is the actual pattern.

According to the World Bank, a nation's Gross National Income

(GNI) per capita, per year, classifies the nation's economic developmental standing. The World Bank utilizes four standings for classification: low income (\$1,035 or less), lower middle income (\$1,036 to \$4,085), upper middle income (\$4,086 to \$12,615), and high income (\$12,616 or more) (The World Bank, 2013). For the convenience of this study, low income and lower middle income are referred to as developing countries. Nations that are developing can be considered dependent on other countries for capital and are less industrialized and urbanized. Nations classified as upper middle income are considered semi-developing countries, encompassing both first world and third world characteristics. High income countries are considered developed nations, characterized by high levels of industrialization and urbanization.

It is a common assumption in research that in a developing country the main focus of the representing government is to further economic development within the country (Braithwaite, Makkai, and Pittelkow, 1996). As these developing nations are focused on fostering various economic developments, there is perhaps little thought of the ecological consequences the economic developments may cause. "Projects such as dams, industrial facilities, and transnational highways [have been] planned and built," while giving little to no attention to the "potential impacts on the ecosystem or the pollution they might generate" (Leonard and Morell, 1981, p. 281).

While developing nations are focused on economic development, the developed nations can focus on issues beyond their economic stability, such as considering environmental protection (Braithwaite, Makkai, and Pittelkow, 1996). In the final two decades of the last century, carbon dioxide (CO₂) emissions of all developed countries combined increased 21 percent and forest areas slightly increased by one percent. In contrast, in all developing countries combined, CO₂ emissions more than doubled, the forest areas declined by over six percent, and a significant increase in industrial water pollution occurred (Jorgenson, Dick, & Shandra, 2011, p. 57).

In previous literature, many have utilized Ronald Inglehart's theory of post-materialism, based off Maslow's hierarchy of needs, to explain the relationship of environmental values within developed and developing nations. Inglehart coined the terms materialist and post-materialist values. Materialist values are the concern of individuals that are experiencing physical or economic insecurity. Materialists' basic needs for stability and security have not been met, leading materialists to focus on order, stability, and economic strength. Those who encompass post-materialistic values are described as having greater security. Therefore, they can afford to pursue other needs higher on Maslow's hierarchy, such as self-esteem or self-actualization. Consequently, "post-materialists are likely to place higher value on ideas, equality of opportunity, greater citizen involvement in decision making at government and community levels, and environmental protection" (Braithwaite, Makkai, and Pittelkow, 1996, p.1536-37).

According to a study by Cotgrove and Duff (1980), "using a modified form of Inglehart's scale, measuring 'material' and 'post-material' values, [they] found a marked polarization between environmentalists and the public, the former scoring higher on items indicating support for post-material values, and much lower on material items" (p. 77). This suggests that specific relations to core economic institutions of society and class position help determine the values of the environmentalist and the industrialist. Following with previous research, the environmentalist scoring higher on items indicating support of post-materialistic values suggests the individual is part of a developed country, having enough security to focus their post-materialistic values on the environment. The industrialist scoring higher on items indicating materialistic values suggests the individual is part of a developing country, where security of livelihood has not been met, giving no focus to environmental values. Expanding upon this concept, Dunlap and York (2008) argue that it is commonly assumed that poorer individuals "will naturally have a greater incentive to give priority to more goods and services than the environment" and "it would be foolish to make heavy sacrifices of economic progress in interests even of their own environment, let alone that of the world in general" (p.529).

But recent research questions the above implications of environmentalism in relation to post-materialistic values. Environmentalism as a globalized thought and interest is a recently new phenomenon in literature. Nawrotzki and Pampel (2013) allude to a new concept involving the relation between environmental values and post-materialistic values. They theorize that the idea of environmentalism has become a phenomenon that is fostered globally by the rich and poor alike. Individuals of low- socioeconomic status are likely to be environmentally concerned because they depend on the environment more than the rich for their livelihoods. Therefore, those of low-socioeconomic status benefit more from public efforts in protecting the environment. Developing nations are directly exposed to the environmental destruction and pollution, whereas developed nations can pay to protect themselves against such exposures (Nawrotzki & Pampel 2013, p.5).

Previous research offers insight into the environmental values of developed nations versus developing nations. However, research that surrounds post-materialistic and materialistic values in relation to the environment as a concern of semi-developing nations, defined in this study as a nation that has both first and third world characteristics is non-existent. This article attempts to offer a better understanding of the recent ways in which semi-developing nations versus developed nation's value environmentalism in correlation with the materialist and post-materialist values.

METHODS

This research analysis utilizes survey data collected by the World Values Survey Association (WVSA), a non-profit organization that surveys the globe by exploring peoples' "values and beliefs, their stability or change over time, and their impact on social and political development of the societies in different countries of the world" (World Values Survey, 2014). The World Values Survey (WVS) has six waves of surveys from 1981 to 2014. This research specifically utilizes the survey data collected during the fifth wave from 2005 to 2009. This wave has been chosen because it is the most recent wave that encompasses data surveyed from both Argentina and the United States, and it provided important environmental variables for this study. Each country was surveyed in the middle months of 2006. The WVSA administered the survey face to face to 1,002 participants in Argentina, taken from a national, probabilistic multistage sample. The WVSA conducted the survey through personal interviews with 1,710 participants 18 years and older in the United States.

The United States was chosen to represent the developed countries and Argentina was chosen to represent the semi-developing countries. The U.S. is an example of a developed country, with a GNI of \$47,340 in 2006. The nation has well exceeded the minimum of the high income classification, a GNI of \$12,616 or more (The World Bank, 2006). Argentina has been chosen as the semi-developing country, with a GNI of \$6,290 in 2006. The nation's GNI settles in the middle of the upper middle income classification, a GNI of \$4,086 to \$12,615 (The World Bank, 2006). As this survey was administered in the middle months of 2006, both the United States and Argentina were relatively close to entering into a recession. United States entered the great recession at the end of 2007. Argentina entered into their recession in the early months of 2008.

A total of six independent variables were selected, including: age, sex, social class, country association (binary variable: 0=United States, 1=Argentina), a post-materialistic index, and a computed interaction variable (country * post-materialistic index). The first analysis used linear regression to determine the way in which these six variables affect the dependent variable, originally worded as: looking after the environment is important to this person; to care for nature. For clarification this variable will be regarded throughout the rest of this article as, "looking after the environment is important." Utilizing linear regression analysis allows us to quantify the relationship between the explanatory variables and the dependent variables, while controlling for other factors. We can isolate the effect of any independent variable listed above, while holding the effects of the others constant. Controlling for specific variables allows us to understand how individual variables collectively affect the dependent variables. In addition to still utilizing the same six independent variables. A binary logistic regression analy-

sis was conducted with a second dependent variable: how important it is to the individual to focus on protecting the environment (= 0), versus economic growth and creating jobs (= 1). Binary logistic regression analysis helps predict probabilities of the six independent variables effect on the dichotomous dependent variable.

Results

The linear regression analysis focuses on the ways in which the chosen six independent variables affect the dependent variable: looking after the environment is important. Table 1 presents the slopes of the independent variables for each block of the linear regression.

TABLE 1

Table 1: Regression statistics for effects of age, sex, social class, country association, post-materialist index, and interaction variable of country association and post-materialist index on looking after the environment is important to this person, to care for nature.

	1	2	3
Age	(-)0.009	(-)0.009	(-)0.009***
¹ Sex	(-)0.161	(-)0.173	(-)0.170***
Social Class	0.025	0.018	0.016
² Country	(-)0.541	(-)0.57	(-)0.406
Post-Materialist Index		(-)0.218	(-)0.178***
Interaction			-0.087
R ²	0.063**	0.076**	0.077
df	4	1	1
N	2055	2055	2055

¹Reference groups: Male
²Reference groups: United States
*p<.05; **p<.01; ***p<.001
Source: World Values Survey: 2005 -2008

Focusing on block three, the independent variables age, sex, and post-materialism all yield statistically significant results regarding the dependent variable: looking after the environment is important. The results show that for males in the United States a one unit increase in post-materialism leads to being .178 units of lower value in looking after the environment. This is statistically significant at the .001 level, controlling for age, social class, and the interaction. The variables of social class and country did not present statistically significant results, but it is important we do not ignore them since this indicates these variables do not have a significant effect on the dependent variable. In other words, there is no significant variation between the United States and Argentina on valuing the environment. The computed interaction variable (country association * post-materialistic index)

is also not statistically significant, suggesting that in reality there is no difference in how post-materialism across the United States and Argentina affects how important it is to look after the environment.

Next, the binary logistic regression analysis, utilizing the same six independent variables, yielded interesting effects on the dependent variable: how important it is to the individual to focus on protecting the environment, versus economic growth and creating jobs. Table 2 presents the resulting Exp (B) coefficients (the change in the odds ratio associated with one unit of change of the predictor variable) for each variable.

TABLE 2

Table 2: Binary logistic regression statistics for effects of age, sex, social class, country association, post-materialist index, and interaction variable of country association and post-materialist index on how important it is to the individual to focus on protecting the environment, versus economic growth and creating jobs.

	Exp (B)
Age	0.999
¹ Sex	0.824*
Social Class	1.105
² Country	0.220***
Post-Materialist Index	0.780**
Interaction	1.249

¹Reference groups: Male

²Reference groups: United States

*p<.05; **p<.01; ***p<.001

Source: World Values Survey: 2005 -2008

The statistics presented suggest sex, country, and post-materialism all have a significant impact upon the dependent variable: how important it is to the individual to focus on protecting the environment, versus economic growth and creating jobs. The results show that people in Argentina are 78% less likely than people in the United States to value economic growth and creating jobs over protecting the environment, controlling for all other variables in the model. This is statistically significant at the .001 level. The results also show a one unit increase in post-materialism, indicating one is 22% less likely to value economic growth and creating jobs over protecting the environment, controlling for other variables in the model, as hypothesized by the theory of post-materialism. This is significant at the .01 level. Both social class and age did not have a significant effect on the dependent variable. Also, the interaction variable (country association * post-materialistic index) was not significant. This implies there is no difference in how post-materialism across the United States and Argentina affects how important it is to the individual to focus on protecting the environment versus economic growth and creating jobs.

DISCUSSION

Given these results we can make some compelling arguments regarding previous literature. The binary regression analysis suggests that the United States respondents are less likely to care about the environment compared to Argentina respondents. Also, the higher one scores on post-materialism the less they value the importance of looking after the environment. Inglehart's theory of post-materialism is not entirely supported with the results of this study, as he states that the more post-materialistic a country is the more likely it is to place more value on environmental protection. We should expect that U.S. respondents have higher environmental values than Argentina respondents, but we found the opposite in one of the models run here. Inglehart's theory suggests those who relate with post-materialism have greater economic stability, and are then able to focus on other values, such as looking after the environment. The binary logistic regression results show that with one unit increase in post-materialism one is 22% less likely to value economic growth and creating jobs over protecting the environment. This result defends Inglehart's theory, suggesting that as one relates more with post-materialistic values they are less likely to value economic growth and creating jobs over looking after the environment.

The variable of social class is closely related to post-materialism. As Inglehart's theory suggests, as one's social class increases they are more likely to relate with post-materialistic values, and in return they then pursue higher values in relation to the environment. However, both analyses suggest that social class has no significant impact on either the importance of looking after the environment or the importance of fostering economic growth and creating jobs. Social class here was operationalized as socio-economic status: as a scale of wealth based upon education, income, and occupation; separating the rich from the poor. This follows what Nawrotzki and Pampel (2013) suggests in their recent research which states that the rich and poor alike value the environment. The poor value the environment just as the rich, but the poor depend on the environment more than the rich for their livelihoods. This research suggests in reality there is no difference in social class in relation to caring for the environment, at least in Argentina and the United States.

There is a significant variation in valuing economic growth and environmental protection between Argentina and the United States. The United States is 78% less likely to support environmental protection and more likely to support economic growth compared to Argentina. Dunlap and York (2008) articulate that it is commonly assumed that developing countries would be foolish to make sacrifices in economic progress for the environment, both locally and globally. This research does not suggest that semi-developing countries are making economic "sacrifices" for the environment or vice versa. However, it shows that semi-developing countries do not solely

value goods and services over the environment. Previous research suggests that developing countries are focused on economic stability and economic growth over looking after the environment. However, this research indicates the opposite case is true, in relation with the semi-developing nation of Argentina. This study indicates semi-developing countries are not solely focused on economic growth. This could be due to the fact that there is more industry, or economic growth, being created around advancing environmental efforts. It could also be, as Nawrotzki and Pampel (2013) suggest, that those in developing countries are less separated from nature in their daily activities, as they are more focused on self-sustaining agriculture then developed nations.

In both analyses the interaction variable regarding country association and the post-materialistic index did not yield statistically significant results. This indicates that there is no difference in how post-materialism across countries affects the values of looking after the environment, and the importance of protecting the environment versus economic growth and creating jobs. This suggests that post-materialistic values held in each country, the semi-developing and the developed, are acted upon no differently when considering the importance of looking after the environment and protecting the environment versus economic growth and creating jobs. Previous research by Cotgrove and Duff (1980) suggests that there is a great polarization between the post-materialist and the industrialist, as the post-materialist, or developed countries in this case, should score much higher on post-materialistic values than the industrialist or developing countries. This implies that developed countries embrace greater post-materialistic values than developing countries and in return will place higher value on looking after the environment. Nevertheless, this study counters such findings.

Analyses presented in this paper offer new findings that are very seldom found in previous literature: the idea that semi-developing countries may care more for environmental protection than economic growth and creating jobs in comparison to developed countries. More research must be done in the context of semi-developing nations. It is important to expand upon research involving semi-developed nations to better understand their motives in relation to the environment and economic growth; the findings of this study suggest there is more complexity in these dynamics than found in previous studies.

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The Relationship Between Achievement Goals and Psychological Flow

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ABSTRACT

The purpose of this study was to examine the relationship between psychological flow and achievement goals. Although both constructs have been studied extensively, only minimal attention has been focused on understanding the relationship between them. Participants completed three surveys, and positive correlations were found between the overall flow experience and performance-approach goals in both academic and athletic contexts. Mastery-approach goals positively correlated with flow in an athletic context. Significant positive correlations were also found between the individual flow factors and achievement goals. Gender differences were also examined. Results from female participants showed positive correlations in the academic context, while results from male participants revealed negative correlations on the loss of self-consciousness factor.

Keywords: Flow, Achievement Goals, Correlation

Relationship between Achievement Goals and Psychological Flow Introduction and Literature Review

Psychological flow is the experience of being "in the zone" during any activity that is physically or cognitively active. Individuals in flow are more focused on the activity at hand, become less distracted by the surroundings, and may perform better (Csikszentmihalyi, 1990). Flow is also described as being a transformative experience that occurs in roughly 85% of people (Csikszentmihalyi, 1997). Flow is associated with a positive state of mind that results from one's skills being challenged, and is characterized by clear and fluid thoughts and actions, and a sense of control (Jackson & Marsh, 1996).

Research suggests that such a state may be required to experience peak performance (Jackson, Thomas, Marsh, & Smethurst, 2001). Additionally, researchers using magnetic resonance imaging found differences in neural activity during states of flow when compared to boredom or cognitive overload (Ulrich, Keller, Hoenig, Waller, & Grön, 2014). These changes occurred in areas of the brain involved with movement, rewards, and spatial orientation, among others – functional areas that relate to the different components

of the flow experience.

The flow construct has nine factors and can be measured using the Flow State Scale (FSS) (Csikszentmihalyi, 1990; Jackson & Marsh, 1996). These factors are defined as follows. Challenge-skill balance occurs when challenges from the task are perceived as being equal to one's skill level. Action-awareness merging involves one's actions becoming spontaneous. Having clear goals gives purpose to one's actions, and receiving unambiguous feedback from the task informs whether those goals are being achieved. Complete concentration indicates that one's focus is on the task, and a sense of control is the perception that one is in control of the situation. Acting with a loss of self-consciousness involves an individual becoming increasingly involved in an activity, and less concern over self-presentation. A transformation of time refers to the perception of time either speeding up or slowing down. The last factor is autotelic experience, which is simply enjoyment from doing the task.

Flow and achievement goals are important components of the motivation literature, since they are both useful for explaining why and how people invest time and energy into tasks (e.g. Csikszentmihalyi, 1990; Deci & Ryan, 1985; Harackiewicz & Elliot, 1993). Two major types of achievement goals exist: mastery and performance goals. Both goal types focus on an individual's perceived competence (Senko, Hulleman, & Harackiewicz, 2011). Mastery-oriented individuals focus on task mastery relative to past performance, whereas performance-oriented individuals focus on performance relative to others (Elliot & McGregor, 2001). These two goal types can be further divided into either an approach or avoidance focus. Approach goals emphasize pursuing success, while avoidance goals are rooted in avoiding failure (Elliot & McGregor, 2001). Together, these four goal-orientations are known as the 2 x 2 achievement goal framework, which has been examined in both academic (Achievement Goal Questionnaire – Revised (AGQ-R) and athletic contexts (Achievement Goal Questionnaire – Sport (AGQ-S) (Conroy, Elliot, & Hofer, 2003; Elliot & Murayama, 2008).

There have been limited and inconsistent findings regarding gender differences with the achievement goal framework. Alkharusi and Aldhafri (2010) found the 2 x 2 achievement goal framework exhibits structural invariance across genders. However, Murcia, Gimeno, and Coll (2008) found that males were more likely to perceive actions as taking place within a performance-based climate compared to females. Thus, there may be meaningful differences in the flow-goal relationship based on gender.

Minimal research has been conducted to understand the relationship between achievement goals and flow. Of the existing research, some stud-

ies were conducted before the AGQ and FSS were developed (e.g. Jackson & Roberts, 1992; Stein, Kimiecik, Daniels, & Jackson, 1995), and in other research the flow-achievement goal relationship was only partially explored (e.g. Cervelló, Rosa, Calvo, Jiménez, & Iglesias, 2007). Additionally, the findings from other studies have resulted in some conflicting conclusions. For example, mastery more than a performance-orientation in athletes was found to be related to experiencing flow (Jackson & Roberts, 1992). Other studies, however, found no connection between flow and goal-orientation (Jackson, Kimiecik, Ford, & Marsh, 1998). The purpose of the current study was to extend the findings of the previous studies by using the FSS and AGQs.

Hypotheses

The purpose of this study was to examine the relationships between the 2 x 2 achievement goal framework and the flow factors. Given the exploratory nature of this study, only some of the correlational relationships were predicted. For the other variables it was less clear what connections would exist.

Table 1

Hypotheses

H1	Mastery-approach goals will be positively correlated with the overall flow score
H2	Mastery-approach goals will be positively correlated with all nine flow factors
H3	Performance-approach goals will be positively correlated with the overall flow scale
H4A	Performance-approach goals will be positively correlated with seven of the flow factors (challenge-skill balance, action-awareness merging, clear goals, unambiguous feedback, concentration, control, and transformation of time)
H4B	Performance-approach goals will be negatively related to two of the flow factors (loss of self-consciousness and autotelic experience)

Hypotheses were predicted for the general relationship between the variables, however, each of these were looked at separately for each AGQ. Unique hypotheses for those different contexts were not made. Gender differences were also examined in each of these contexts.

Method

Participants

Participants in this study were 144 students enrolled in psychology courses at a mid-sized upper Midwestern university. Demographics were gathered from 120 participants (71 females) between the ages of 18 and 31

($M = 20.1$, $SD = 2.3$). This portion of the sample included freshmen (39.2%), sophomores (24.2%), juniors (14.2%), seniors (16.7%), and 5.8% other responses. Our sample contained individuals with the following ethnicities: Asian Americans (3.3%), Caucasians (91.7%), Hispanics (1.7%), Native Americans (0.8%), and those who identified as other (2.5%). Participants received course credit for their participation.

Measures

Flow State Scale. The FSS examines the overall experience of flow, as well as each of the nine factors individually (Jackson & Marsh, 1996). This scale contains a five point Likert-type scale (1 = Strongly disagree to 5 = Strongly agree). Cronbach's alpha for the overall flow measure was .94. See Table 2 for additional information about the FSS factors.

Table 2

FSS Sample Items and Subscale Reliabilities

Subscale	Sample Item	α
Challenge-skill balance	"The challenges and my skills are at an equally high level"	.82
Action-awareness merging	"Things seem to happen automatically"	.77
Clear goals	"I have a clear idea of what I want to do"	.85
Unambiguous feedback	"It is clear to me that I am doing well"	.82
Concentration	"I have total concentration"	.83
Control	"I feel in total control of my body"	.84
Loss of self-consciousness	"I am not worried about what others are thinking of me"	.61
Transformation of time	"The way time passes seems to be different from normal"	.82
Autotelic experience	"I really enjoy the experience"	.84

The FSS is often administered after a physically active event, but for this study, participants were asked to complete the survey during class time. To account for this, the language was modified so that participants were instructed to report on past instances in which they experienced flow.

Achievement Goal Questionnaire-Revised. The AGQ-R consists of 12 items addressing four goal-orientations, three items per subscale (Elliot & Murayama, 2008). Items are rated on a five point Likert-type scale (1 = Strongly disagree to 5 = Strongly agree). Example items per subscale with the internal consistency listed in parentheses are as follows: Mastery-approach: "My goal is to learn as much as possible" ($\alpha = .78$); performance-avoidance: "My aim is to avoid doing worse than other students" ($\alpha = .86$); performance-approach: "I am striving to do well compared to other students" ($\alpha = .77$); mastery-avoidance: "My aim is to avoid learning less than I possibly could" ($\alpha = .76$).

For this scale, instructions were modified to focus on an academic context and the goal statements were also reordered, which resulted in a mastery-approach, performance-avoidance, performance-approach, and mastery-avoidance sequence. Instructions read as follows: "While reading these statements, think of how they apply to your recent academic behaviors. Please circle the one response for each item that best describes how much you agree or disagree. Carefully read each statement before answering. There are no correct or incorrect responses."

Achievement Goal Questionnaire-Sport.

The AGQ-S (Conroy et al., 2003) was developed for use in sport contexts and is very similar to the previously described AGQ-R. The AGQ-R items focus on learning whereas the AGQ-S items focus on performance. For example, a performance-approach statement from the AGQ-S reads: "It is important for me to perform better than others." Internal consistencies are as follows: mastery-approach: $\alpha = .82$; mastery-avoidance: $\alpha = .83$; performance-approach: $\alpha = .87$; performance-avoidance: $\alpha = .77$.

Procedure

Data was gathered from students in multiple classrooms, using a non-random sampling procedure. The researcher gave a brief description of the study and then distributed implied consent forms. If students agreed to participate, they were given time to ask questions before the surveys were dispersed and completed the packet in group-format in their classroom. In the packets, the AGQ-R and AGQ-S were the first two surveys, and they were counterbalanced. The next survey was the FSS, followed by a demographic questionnaire. At the end of the session, participants were debriefed and thanked for their time.

RESULTS

Pearson's two-tailed correlational analyses were calculated between the FSS, AGQ-R, and the AGQ-S (see Table 3). Results indicate partial support for H1, with a positive relationship between the overall flow experience and mastery-approach goals on the AGQ-S, $r = .33$, $p = .001$, $R^2 = .109$. Similarly, partial support was found for H2 in the AGQ-S. Mastery-approach goals were positively correlated with action-awareness, $r = .27$, $p = .001$, $R^2 = .073$; challenge-skill balance, $r = .18$, $p = .035$, $R^2 = .032$; having clear goals, $r = .26$, $p = .002$, $R^2 = .068$; receiving unambiguous feedback, $r = .32$, $p = .001$, $R^2 = .102$; experiencing concentration, $r = .20$, $p = .015$, $R^2 = .040$; sense of control, $r = .32$, $p = .001$, $R^2 = .102$; and overall autotelic experience, $r = .35$, $p = .001$, $R^2 = .123$. With the AGQ-R, there were positive correlations between mastery-approach goals and having clear goals, $r = .21$, $p = .010$, $R^2 = .044$, receiving unambiguous feedback, $r = .20$, $p = .019$, $R^2 = .040$, and having an overall autotelic experience, $r = .20$, $p = .018$, $R^2 = .040$. H3 was that performance-approach goals would correlate positively with the overall flow experience. This was supported in both the AGQ-R, $r = .20$, $p = .016$, $R^2 = .040$, and AGQ-S, $r = .18$, $p = .032$, $R^2 = .032$.

The data partially supported H4A. Specifically, within the AGQ-S, performance-approach goals were positively related to action-awareness, $r = .19$, $p = .20$, $R^2 = .036$; having clear goals, $r = .17$, $p = .046$, $R^2 = .029$; receiving unambiguous feedback, $r = .18$, $p = .034$, $R^2 = .032$; and having a sense of control $r = .19$, $p = .023$, $R^2 = .036$. In the AGQ-R, performance-approach goals were positively related to action-awareness, $r = .23$, $p = .005$, $R^2 = .053$; receiving unambiguous feedback, $r = .20$, $p = .017$, $R^2 = .040$; experiencing concentration, $r = .18$, $p = .027$, $R^2 = .032$; and a sense of control, $r = .20$, $p = .018$, $R^2 = .040$.

H4B was not supported since there was no relationship between loss of self-consciousness and performance-approach goals, and there were positive correlations between performance-approach goals and an autotelic experience in the AGQ-S, $r = .24$, $p = .004$, $R^2 = .058$, and the AGQ-R, $r = .20$, $p = .015$, $R^2 = .040$.

Gender differences were also examined; results for females are displayed in Table 4, and results for males are in Table 5.

Table 3

Correlations between Flow State Scale and Achievement Goal Questionnaires

	AGQ-R				AGQ-S			
	Mast.	Mast.	Perf.	Perf.	Mast.	Mast.	Perf.	Perf.
	Appr.	Avoid.	Appr.	Avoid.	Appr.	Avoid.	Appr.	Avoid.
Challenge Skill	.01	.06	.06	.14	.18*	-.15	.08	.03
Balance								
Action	.07	.04	.23**	.25**	.27**	.13	.19*	.16
Awareness								
Clear	.21**	.01	.15	.13	.26**	.01	.17*	.17*
Goals								
Unambiguous	.20**	.19*	.20*	.17*	.32**	.07	.18*	.16
Feedback								
Concentration on	.08	.07	.18*	.13	.20*	-.02	.12	.05
task								
Sense of Control	.09	.11	.20*	.17*	.32**	.05	.19*	.14
Loss of self-	.09	.07	-.06	-.07	.13	-.16	-.06	-.19*
consciousness								
Transformation	-.03	.14	.08	.11	.06	.07	.03	.08
of Time								
Autotelic	.20*	.03	.20*	.23**	.35**	.08	.24**	.20*
Experience								
Flow	.15	.12	.20*	.20*	.33**	.02	.18*	.13
Overall								

Table 4

*Correlations between Flow State Scale and Achievement Goal Questionnaires for Female**Participants*

	AGQ-R				AGQ-S			
	Mast.	Mast.	Perf.	Perf.	Mast.	Mast.	Perf.	Perf.
	Appr.	Avoid.	Appr.	Avoid.	Appr.	Avoid.	Appr.	Avoid.
Challenge Skill								
Balance	.15	.11	.17	.24*	.16	.08	.06	-.04
Action								
Awareness	.18	.03	.18	.18	.28*	.26*	.10	.00
Clear								
Goals	.24*	.04	.24*	.16	.17	.06	.11	.05
Unambiguous								
Feedback	.11	.20	.30*	.31**	.15	.01	.12	.03
Concentration on								
task	.00	.04	.29*	.20	.07	.02	.04	-.08
Sense of Control	.07	.21	.30*	.36**	.18	.09	.14	.08
Loss of self-								
consciousness	.28*	.14	.18	.16	.15	.01	.15	-.00
Transformation of								
Time	.05	.18	.22	.16	.15	.16	.14	.14
Autotelic								
Experience	.33**	.04	.22	.21	.30*	.12	.22	.06
Flow	.21	.16	.33**	.31**	.25*	.12	.17	.04

Table 5

Correlations between Flow State Scale and Achievement Goal Questionnaires for Male Participants

	AGQ-R				AGQ-S			
	Mast.	Mast.	Perf.	Perf.	Mast.	Mast.	Perf.	Perf.
	Appr.	Avoid.	Appr.	Avoid.	Appr.	Avoid.	Appr.	Avoid.
Challenge Skill								
Balance	-.10	.01	-.11	-.05	.04	-.40**	-.08	.00
Action								
Awareness	-.09	-.09	.18	.20	.22	-.03	.14	.17
Clear								
Goals	.08	-.08	.09	.11	.17	-.16	.10	.20
Unambiguous								
Feedback	.17	.10	.09	.04	.46**	.03	.15	.22
Concentration on								
task	.09	-.04	-.06	-.10	.17	-.12	-.06	.00
Sense of Control	.18	-.08	.01	-.18	.45**	-.07	.07	.07
Loss of self-								
consciousness	-.16	-.13	-.34*	-.41**	.09	-.34*	-.34*	-.38**
Transformation of								
Time	-.24	.04	.09	.16	-.10	-.14	-.09	.12
Autotelic								
Experience	.00	-.11	.15	.25	.37**	.13	.21	.33*
Flow	-.03	-.07	.03	.03	.32*	-.19	.02	.15

DISCUSSION

In this study, the relationship between achievement goals and psychological flow was examined. Full support was found for one hypothesis, and partial support was found for three others. Due to the limited amount of previous research involving these two constructs, explanations of the data should be interpreted with caution.

H1 stated that mastery-approach goals would be positively correlated with the overall flow experience. Support for this was found with the AGQ-S, but not the AGQ-R. These results partially align with research conducted by Jackson and Roberts (1992), who found a positive relationship between task-oriented goals and experiencing flow. Our results from the AGQ-R contradict research done by Guo and Ro (2008) who found that students experienced flow in a lecture-based classroom setting. Those researchers found that students experienced a sense of control, concentration, and enjoyment (i.e. autotelic experience) during the lecture. When considering those three factors in our sample, autotelic experience was the only factor that was significantly correlated with mastery-approach goals. It is possible that this difference could be accounted for by the methodology used. Specifically, asking students to recall an academic-related situation when they experienced flow may have been more difficult than thinking about a physical activity.

As proposed in H2, mastery-approach goals would correlate positively with all nine flow factors. This was supported with the AGQ-S, where there were significant positive correlations between having a mastery-approach goal-orientation and experiencing seven of the nine flow factors. With the AGQ-R, however, only three factors were positively correlated with a mastery-approach goal-orientation: having clear goals, receiving unambiguous feedback, and having an autotelic experience. The data show that individuals with a mastery-approach goal-orientation may have a more difficult time finding optimal experiences in academic work. The contrast between flow in the AGQ-R and AGQ-S may be explained by Gute and Gute (2008), who discuss the pervasiveness of detachment in college courses. If the presence or absence of flow can be considered a measure of engagement, then the results appear to support the academic disengagement phenomenon, at least for individuals with a mastery-approach goal-orientation.

H3 stated that performance-approach goals would be positively correlated with the overall flow experience. This hypothesis was supported with the AGQ-R and AGQ-S. Specifically, there were moderate positive correlations between performance-approach goals and the overall flow experience.

Partial support was found for hypothesis H4A, where it was specu-

lated that performance-approach goals would be positively correlated with seven flow factors: challenge-skill balance, action-awareness, clear goals, unambiguous feedback, concentration, control, and time transformation. Five of these factors have significant positive correlations between performance-approach goals in at least one context. Interestingly, however, two of these factors, challenge-skill balance and time transformation, were not correlated with a performance-approach orientation in either context.

Upon further investigation, when looking at the challenge-skill factor across all goal types in both contexts, only one significant relationship occurred – this was for the mastery-approach goal-orientation. According to Csikszentmihalyi (1990), a challenge-skill balance is often enhanced by competitive situations, which would appear to be a more relevant factor for individuals with performance goals.

Additionally, Csikszentmihalyi and Csikszentmihalyi (1988) assert that a challenge-skill balance is a universal precondition for flow. This is puzzling since even though this factor was not significantly related to a performance-approach goal-orientation, there was still a positive correlation between performance-approach goals and the overall flow experience.

The time transformation factor showed nearly identical results. In this case, the non-significance could have resulted from participants referring back to times where time pressure may or may not have been as important to the activity. It could also be due to time transformation being a possible outgrowth of different factors such as concentration (Csikszentmihalyi, 1990).

H4B stated that performance-approach goals would be negatively correlated to a loss of self-consciousness and autotelic experience. The data showed that with the AGQ-R and AGQ-S, a loss of self-consciousness was not correlated, and an autotelic experience was positively correlated. The low reliability for the loss of self-consciousness factor may have contributed to this finding.

In addition to the hypotheses, when looking at the combined data from all participants, two flow factors were significantly correlated with both approach goal types in the AGQ-R and AGQ-S: an autotelic experience and receiving unambiguous feedback. Because of this occurrence, these two flow factors may be important elements of the overall flow experience for approach-oriented individuals. This is not surprising since Csikszentmihalyi (1975) suggested that people seek activities that are intrinsically rewarding. Also, when considering the factor of unambiguous feedback, phenomena such as the negative self-efficacy effect (see Schmidt & DeShon, 2009) may explain some of the results.

Gender Differences

In addition to looking at the results separately with the ACQ-R and AGQ-S, gender differences were also examined. These analyses revealed some interesting patterns. Specifically, the data from male participants showed that nine of the 11 significant correlations were contained within the AGQ-S. This effect could simply be the result of males being able to recall more sport-related flow promoting activities compared to academic-related activities.

The data from male participants also showed that, with the ACQ-R and AGQ-S, there was a moderate negative correlation for individuals who had performance goal-orientations and the ability to experience a loss of self-consciousness. This was the only instance that significant negative relationships were mirrored in both contexts. Extending on this observation, there were also no significant relationships between performance-oriented males and the overall flow experience. Since this effect was observed in performance goals (i.e. socially normed competence), it may be worthwhile for future researchers to assess the relationship between performance goals and other socially relevant phenomena such as self-monitoring (see Lennox & Wolfe, 1984). Doing so may elucidate what conditions inhibit performance-oriented males from experiencing a loss of self-consciousness.

Another trend for males was that a mastery-approach orientation was the only goal type with multiple significant relationships between flow factors. These relationships were moderate for unambiguous feedback, sense of control, and autotelic experience. The significance of the overall flow experience for this goal-orientation supports research conducted by Jackson and Roberts (1992) who found that athletes with high mastery-orientation experienced flow more frequently than individuals with a competitive-orientation.

Another observation from the males was the significant positive relationship between performance-avoidance goals and an autotelic experience in the AGQ-S. That result shows that, in sport activities, performance-avoidance males have autotelic experiences, which is somewhat supportive of research done by Bailis (2001), who found that athletes who engage in self-handicapping report higher levels of optimal experience after competitive events.

When looking at the data from female participants, there was a different trend overall; their data contained 12 of 16 significant relationships within the academic context.

For females, a positive correlation between performance-approach and mastery-approach goals and action-awareness was found. This is not sur-

prising since Csikszentmihalyi (1990) identifies this factor as one of the most universal characteristics of flow reported by individuals.

For females, the data also showed that individuals who reported being performance-oriented had moderate, positive relationships between several flow factors. Two of these factors, unambiguous feedback and a sense of control, were present in both performance goal types. As discussed earlier, the significance of unambiguous feedback may be explained by the negative self-efficacy effect or other self-regulation theories. Sense of control could perhaps be related to females having more of an internal locus of control when it comes to academic-related subject matter. The fact that most of the significant relationships for females involve socially normed goals suggests that there may be some social dynamics in an academic environment that could promote flow.

Limitations and Suggestions for Future Research

Although this study revealed some contrasts between goals, flow experiences, and gender, there were also limitations. First, the FSS was administered in a classroom setting and instructed students to think back to times when they may have experienced flow. This approach is different from the one that has been used by Jackson and colleagues (Jackson, et al., 1998), where they surveyed groups of athletes immediately after a common sporting event. Not having a common reference activity may have influenced the quality of our results. Related to this, the items were modified to refer to an event in general, rather than a specific event. Additionally, the instructions were written to inform participants of times when flow may have occurred. Although we attempted to write the instructions in an objective manner, they may have unknowingly introduced response biases.

The sample also contained limitations, since it had more females (59 percent) compared to the university population (47 percent), and participants were younger ($M = 20.1$) compared to the university population ($M = 23.0$) (Office of Planning, Assessment, Research & Quality, 2014). This suggests that the sample may not have been an accurate representation of the undergraduate population at the institution, and thus, the characteristics of the participants may extend better to a certain college(s) within the university. Similarly, since it was a student sample, results may not be as applicable to non-student populations. Future investigations should include a more diverse sample to maximize external validity.

CONCLUSION

This study showed that there are differences between individuals who report different goal-orientations and their respective frequencies of experiencing flow factors. In general, approach goals are associated with flow when thinking about sports, and performance goals are associated with flow when thinking about academics. Additionally, females reported experiencing flow factors more when they thought about academics, especially if they reported having performance goals. In contrast, when males thought about sports, individuals with mastery-approach goals reported experiencing flow factors more frequently. However, males also reported experiencing a loss of self-consciousness less frequently in both contexts.

More research is needed to understand the flow-achievement goal dynamics, but if these results can be replicated, they may provide insight for developing training programs. For example, teachers, coaches, trainers, and managers may be able to adjust their approaches to accommodate individuals with different goal-orientations or genders. Doing so could increase an individuals' ability to experience flow, and in turn, achieve optimal performance.

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Saudi Arabian University Student Cultural Integration: An Analysis of International Student Experiences and Domestic Student Perceptions

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ABSTRACT

How can we encourage social and cultural exchange among domestic and international student populations to encourage empathy, thoughtfulness, and strong international relationships? I use mere exposure and social exchange theories with interviews and surveys to qualitatively and quantitatively study the barriers to cultural integration of Saudi Arabian students and domestic students. 1) Mere exposure to Saudi Arabian students correlates with domestic students perceiving Saudi Arabian students more positively; 2) Mere exposure to Saudi Arabian students correlates to the fostering of a sense of relatability among domestic students 3) Mere exchange could lead to greater socialization between Saudi Arabian international students and domestic students at UW-Stout.

Key Words: University Integration, Saudi Arabia, Socialization

INTRODUCTION

Today at the University of Wisconsin-Stout Saudi Arabian students make up the majority of all international students enrolled. The total population of international students at UW-Stout is 240, and of that 127 are from Saudi Arabia. Across the nation, international students make up a sizeable portion of higher education students, and the number of international student enrollment in United States universities is steadily growing (Olivas & Li, 2006; Rai, 2002; Lubell & Brennan, 2007; Phibbs & Young, 2009). Many questions should be asked regarding cultural integration, acceptance, experience, and domestic student perception of the Saudi Arabian student presence. Cultural integration refers to one's ability to assimilate into or adapt to a culture other than their own. Cultural exchange refers to the passing of cultural traditions, practices, ideologies and ways of looking at the world, between people of different cultures. Finally, social exchange simply refers to the act of socializing. Specifically, for the purposes of this study, the scope of social exchange is narrowed to exchange between domestic students and Saudi Arabian international students. The interactions that Saudi Arabian students

encounter on a daily basis can inform us as to whether cultural integration is successfully taking place through social exchange. Further, domestic students' perception of Saudi Arabian students can inform us on what conditions encourage social and cultural exchange between the two populations. A major goal of this exploratory is to identify factors that can inform us on how we can encourage cultural exchange between domestic students and Saudi Arabian students at UW-Stout. This provides benefits in the form of encouraging domestic students to engage in more empathetic, open-minded thinking to strengthen relationships with their contemporaries from Saudi Arabia and vice versa.

Lithterature Review

Previous research in the area of international student integration focuses on barriers to adjustment. Compared to their domestic counterparts, international students tend to experience greater adjustment difficulties and more distress during their initial transition into the university. These barriers include feelings of social loss due to exposure to an unfamiliar culture, and a lack of English language skills, which are necessary to integrating into American culture. (Paltridge & Schapper; Fincher & Shaw 2009; Rai, 2002; Hayes & Lin, 1994; Barratt & Huba, 1994). Past research identified positive correlation between international students' experience and oral English language skills (Barratt & Huba, 1994; Coles & Swami, 2012). University of Wisconsin-Stout addresses this issue with the English as a Second Language (ESL) Institute. The program offers year-round English immersion courses to non-native English speakers, including free tutoring services, small class sizes, and a conversation partner program. The inability to effectively communicate with host nation locals is not the only potential barrier that international students face when attempting to adjust to academic life in a new country.

The attitudes of others and the extent to which host nation locals make an effort to provide traditional options for foreign students must be examined. Upon arrival to the host nation, international students need to secure housing, a general food supply, and gain a general knowledge of the educational institution. Further, they are usually under pressure to settle in quickly in order to begin their academic work. Finding accommodation can be difficult. (Obeng-Odoom, 2012). International students arrive with less than a month to find housing. It is particularly difficult given their limited knowledge of local housing markets. This is made even more difficult when one takes into consideration international students' limited knowledge of local housing markets. Research in Sydney, Australia reveals that international students' knowledge of the housing market in Sydney was not, on average,

as good as local students (Obeng-Odoom, 2012). For these students, setting up house in the U.S. is a major task because of the supplies needed-everything from bed linens to furniture (Poyrazli & Grahame, 2007). Past research shows that housing plays a critical role in the process of obtaining quality education for both international students and their domestic counterparts. (Lubell & Brennan, 2007; Phibbs & Young, 2009) As a level of relative security is expected, university accommodations or on-campus housing often fosters a feeling of physical security among international students (Paltridge & Schapper, 2010). Many international students, however, prefer to live off campus.

Beyond previous research on foreigners' experience in a host country, research regarding perception of foreigners by those of a host country is limited. This research examines local citizens of a German town perceive foreign visitors. How one is perceived can influence how that person is treated, subsequently affecting that person's experience. Research that explores perception of foreigners in Germany concluded, "respondents living in regions with a below-average share of foreigners have a considerably higher probability to agree with the claim that foreigners are a burden on the German social security system" (Fertig & Schmidt, 2011, p. 1890). A lack of exposure seems to result in a negative perception of a foreigner. The question still remains as to how domestic students at the University of Wisconsin-Stout perceive the presence of Saudi Arabian students. What social conditions encourage social and cultural exchange between domestic students at UW-Stout and Saudi Arabian international students? I will expand on the previous research by exploring how domestic students perceive Saudi Arabian students and whether such perception is impressionable. This research will contribute to the literature on the topic of international students in university systems by examining potential barriers and contributors to creating an environment that encourages social and cultural exchange.

Theory

In order to properly answer these questions, we must view them through a theoretical lens. The research lends itself to the mere exposure theory and the social exchange theory. Mere exposure theory attempts to explain why people tend to gain a preference for stimuli to which they are repeatedly exposed. The mere exposure theory provides that repeated exposure to a given stimuli tends to foster preference toward the stimuli. Further, familiarity breeds a preference toward a given stimuli more so than it breeds contempt. Finally, people tend to acquire a taste for stimuli over time and through repeated exposure (Zajonc, 1968). This theory will be applied to Saudi Arabian international students.

This study draws upon the social exchange theory, which was developed by George Homans (1958). This theory has been expanded by many social scientists including Peter M. Blau. For the purpose of this study we will draw upon aspects of Peter M. Blau's version of the social exchange theory. Social exchange theory provides three basic principles that guide this research. First, people are rationally motivated in exchanges and weigh costs and benefits just like an economist would argue. However, people weigh the costs and benefits of gaining social capital as opposed to currency-driven cost/benefit analysis. Social capital is the social benefit one may expect from preferential treatment of another. It refers to the "features of social organization, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions" (Putnam, 1993, p.167). Such actions as adhering to social norms, building social networks, and ultimately establishing trust will likely lead to building social capital. When alternatives are present people tend to gravitate toward social exchange among equals. It is easier to build social capital among like-minded individuals as the likelihood of disagreement is reduced. Finally, social capital, and the opportunity to gain more, is at the forefront of social exchange. As stated above, social capital is the expected social benefit that can be gained by a particular person and interaction. From these principles, two basic norms become manifest. The first is the norm of reciprocity and this will be account for a large portion of the focus in the discussion section. Reciprocity, in terms of social exchange theory, refers to one's willingness to respond or take part in another's attempt at social exchange. For one to risk social exchange, one must trust that the other participant will reciprocate. The second norm that manifests is the norm of fair exchange. Fair exchange refers to an expectation that the other participant will seek fairness for both sides in the relationship. This expectation for both parties to be fair to each other becomes more and more central as the relationship progresses. Since, predictable reciprocity is the key that links these theories together, it follows that these theories are equally important to explaining the behaviors in this study. Repeated exposure to a given individual or group will likely lead to social exchange between the two individuals or groups.

Social exchange theory provides that social exchange is distinct from economic change in four ways. First, social exchange lacks specificity whereas an economic exchange involves exact figures. Second, social exchange is dependent upon trust because of the lack of specificity. When one risks social exchange he or she must trust the other participant to reciprocate. Third, Social exchanges provide more meaning beyond themselves whereas economic exchanges mean nothing more than the value of the currency owed.

Finally, social benefits are less detached from the source because the value of any social exchange is dependent upon the participants. Mere exposure theory works in conjunction with social exchange theory. With an increase in the frequency of exposure of domestic students to Saudi Arabian students, we see an increase in the opportunity of one interacting and subsequently the likelihood of cultural exchange. The likelihood of one gaining social capital would therefore increase.

METHODS

This study is a combined inductive and deductive quantitative research study involving University of Wisconsin-Stout students. A survey was created using Qualtrics online survey software via the University Wisconsin-Stout survey distribution clearinghouse services. Two separate surveys were created for each population. Both surveys consisted of eight questions designed to measure the different ways in which domestic students perceive Saudi Arabian students at UW-Stout and how Saudi Arabian students perceive domestic students at UW-Stout. "The questionnaire as a whole must allow you to capture all the information you are looking for" (Antonius, 2013, p. 8). The brevity of the survey was done to encourage greater participation by not subjecting participants to extended time commitments while still capturing as much pertinent data as possible.

A stratified random sample of 451 UW-Stout domestic and Saudi Arabian students was obtained from the UW-Stout Planning, Assessment, Research, and Quality office (PARQ). A stratified random sample was requested because the populations that were being studied had subgroups within them. "Sometimes the population consists of various subgroups, and we want to be sure that each subgroup is adequately represented in the sample" (Antonius, 2013, p. 30). This method of sampling allowed for both the domestic student population and the Saudi Arabian international student population to be adequately represented. The survey was sent out to the participant pool on Monday, March 31, 2014. Monday was chosen because of the assumption that students would be more likely to respond to the complete survey after two days of no classes. The survey was sent out again on Monday, April 14, 2014. Regression analysis was conducted only on the domestic student responses to focus on how domestic students perceive Saudi Arabian international students. Causal relationships were not found in the study; however, strong correlations were uncovered. The statistical significance alpha level was set at .10.

RESULTS

This study was supplemented by three qualitative interview sessions in order to provide context to the current environment at UW-Stout as Saudi Arabian students see it. Socialization does not often occur between Saudi Arabian students and their domestic counterparts. Though, many Saudi Arabian students participate in extra-curricular activities and enjoy their time studying at UW-Stout, most spend much of their free time in two major metropolitan cities: Minneapolis, MN and Chicago, IL. These cities provide diverse environments that offer traditional Saudi Arabian restaurants, grocery stores, and religious establishments. Analysis of the interviews indicated that a lack of socialization and subsequently cultural exchange occurs between Saudi Arabian students and domestic students. The quantitative analysis provides a more intimate look at how to encourage socialization.

Several statistically significant correlations were identified from analyzing survey data (see Table 1). These will be interpreted in the Discussion section. A positive correlation occurs when the relationship between two variables is such that when one increases the other increases. A negative correlation occurs when the relationship between two variables is such that when one increases the other decreases. A positive correlation exists between domestic student's age and whether they have had a class with Saudi Arabian students.

Specifically, the older a domestic student is we can expect that they have taken more classes, and thus increases the likelihood that a domestic student would have had a class with a Saudi Arabian student. This is a .27 correlation and is statistically significant at the .06 level. Thus, we reject the null hypothesis that no correlating relationship exists between domestic student's age and whether the domestic student has had a class with a Saudi Arabian student. A moderately strong .457 positive correlation exists between domestic students spending time with Saudi Arabian students outside of class and domestic students feeling that they can relate to Saudi Arabian students.

This correlation is statistically significant at the .001 level. Thus, we reject the null hypothesis that no correlating relationship exists between domestic students spending time with Saudi Arabian students outside of class and domestic students having feelings of relating to Saudi Arabian students. A moderately strong .444 positive correlation exists between domestic students feeling that they can relate to Saudi Arabian students and whether they believe that Saudi Arabian students make an effort to get to know American students. This correlation is statistically significant at the .001 level. Thus, we reject the null hypothesis that no correlating relationship exists between domestic students feeling that they can relate to Saudi Arabian students and whether they feel that Saudi Arabian students make an effort to get to know

TABLE 1

	Age	Attended class with Saudi Arabian Students?	How much interest have you taken in Saudi Arabian culture?	Relatability among domestic and Saudi Arabian students	Do you think Saudi students make an effort to get to know American students?	Do you spend time outside of class with Saudi Arabian students?
Age	1	0.27	-0.082	-0.011	0.157	-0.026
Sig. (2-tailed)		0.055*	0.595	0.944	0.296	0.863
N	51	51	44	46	46	46
Attended Class with Saudi Arabian Students?						
	0.27*	1	-0.091	-0.072	-0.007	0.025
Sig. (2-tailed)	0.055		0.538	0.616	0.96	0.861
N	51	56	48	51	51	51
How much interest have you taken in Saudi Arabian culture?						
	-0.082	-0.091	1	-0.184	-0.093	.423***
Sig. (2-tailed)	0.595	0.538		0.227	0.543	0.004
N	44	49	48	45	45	45
Relatability among domestic and Saudi Arabian students						
	-0.011	-0.072	-0.184	1	.444****	.457****
Sig. (2-tailed)	0.944	0.616	0.227		0.001	0.001
N	46	51	45	51	51	51
Do you think Saudi students make an effort to get to know American students?						
	0.157	-0.007	-0.093	.444****	1	0.22
Sig. (2-tailed)	0.296	0.96	0.543	0.001		0.121
N	46	51	45	51	51	51
Do you spend time outside of class with Saudi Arabian students?						
	-0.026	0.025	.423***	.457****	0.22	1
Sig. (2-tailed)	0.863	0.861	0.004	0.001	0.121	
N	46	51	45	51	51	51

* $p < .10$. ** $p < .05$. *** $p < .01$. **** $p < .001$.

DISCUSSION

Encouraging further integration between domestic and Saudi Arabian students both in the classroom and in extra-curricular organizations will likely lead to a collegiate environment that is more enriched in cultural diversity. Social exchange does not often occur between American and Saudi Arabian students at UW-Stout. As a result, Saudi Arabian students tend to gravitate toward an exclusively Saudi Arabian social circle subsequently perpetuating a lack of social and cultural exchange. There are, however, other factors that contribute to this phenomena in regards to how domestic students at UW-Stout perceive the presence of Saudi Arabian international students, illustrated in the quantitative data analysis above.

The first positive correlation between domestic student's age and whether they have had a class with Saudi Arabian students can be explained by understanding that older students tend to have taken more classes than younger students. Taking more classes increases the likelihood that Saudi Arabian students would also take some of the classes taken. This suggests that the more established policy becomes regarding integrating Saudi Arabian students, the more likely students will eventually take a course with them and be prepared to exchange socially with them.

The second significant positive correlation between domestic students spending time with Saudi Arabian students outside of class and domestic students feeling that they can relate to Saudi Arabian can be explained by a combination of the mere exposure theory and the social exchange theory. Mere exposure theory provides that people build a preference toward a given stimuli over time through repeated exposure. The term preference in this context does not mean that a domestic student prefers to spend time with a Saudi Arabian student compared to a domestic student; rather, it means that domestic students view Saudi Arabian students positively. Spending time outside of class provides consistent exposure to Saudi Arabian students, and by building this preference one gains a deeper feeling that he or she can relate to Saudi Arabian students. Social exchange theory provides that when alternatives are present people tend to gravitate toward exchange among equals. People view other people as equals when they believe that they can relate to them because there is a sense of sameness or equality. Thus, repeated exposure may encourage domestic students to view Saudi Arabian students as equals. It may then increase the likelihood that they engage in social and cultural exchange with them on a more consistent basis.

The third significant positive correlation between domestic students feeling that they can relate to Saudi Arabian student and whether they believe that Saudi Arabian students make an effort to get to know domestic stu-

dents can be explained by the social exchange theory. People tend to view an honest effort as positive and the opposite negatively. In a sense this question requests the participant to essentially pass judgment upon a Saudi Arabian student in terms of whether the domestic student believed that an honest effort was made to get to know domestic students or not. Social exchange theory provides that gaining social capital is a major goal of social exchange. Simply relating to Saudi Arabian students encourages one to identify with that person. According to social exchange theory, Saudi Arabian students actually gain a level of social capital because of domestic students assigning a degree of importance to Saudi Arabian students. This social capital may encourage domestic students to further identify with Saudi Arabian students and conclude that Saudi Arabian students make a considerable effort to try to get to know domestic students, thus, viewing them more positively. This further suggests that policies on campus to encourage positive impressions of Saudi Arabian students will increase the likelihood of social capital gained in exchange with them by domestic students. The significant negative correlation between domestic students spending time with Saudi Arabian students outside class and whether they believe that they have taken an interest in Saudi Arabian culture can further add depth to the above finding. It is likely that domestic student spent time outside of class with Saudi Arabian students learned a little about Saudi Arabian culture. This may have made domestic students realize that they did not previously take much of an interest in Saudi Arabian culture, and thus know very little about it. Another possible explanation could be that perhaps the Saudi Arabian students put off domestic students when they interacted with them. This may encourage domestic students to become even less interested in Saudi Arabian culture. Another explanation is perhaps these domestic students recognize the unwelcoming environment toward Saudi Arabian students at UW-Stout, and feel as though they have not taken (or even should not take) much interest in Saudi Arabian culture. It is also possible that the time domestic students spent with Saudi Arabian students was coincidental and didn't provide the right circumstances to encourage direct interaction. A final possibility is that perhaps the time spent with Saudi Arabian students outside of class occurred in university sponsored clubs that only meet once or twice a semester, and therefore this limited interaction made domestic students feel as though they have not taken much of an interest in Saudi Arabian culture. Nonetheless, more research is required to answer this question. Specifically, further deductive qualitative research would likely provide the best insight into this quantitative finding.

Combined with theory, this data offers an important narrative. Mere exposure to Saudi Arabian students encourages domestic students to perceive

Saudi Arabian students more positively. This encourages domestic students to relate to Saudi Arabian students on a deeper level and thus encourages them to identify with them. This identification allows for Saudi Arabian students to gain a level of social capital in relation to domestic students. Since social exchange is likely to take place among equals and domestic students being exposed to Saudi Arabian students on a consistent basis fosters a view of equality, one can deduce that exposure encourages increased social exchange between domestic students and Saudi Arabian students. Therefore, increased exposure to Saudi Arabian students encourages domestic students to view them with preference, and perhaps encourages domestic students to risk social exchange.

By applying the mere exposure theory we can assume that repeated exposure to Saudi Arabian students both inside and outside the classroom encourages domestic students to relate to Saudi Arabian students on a deeper level. Applied to campus clubs and classroom discussion, these two theories and data from this study suggest that Saudi Arabian students can gain social capital among domestic students, which may very well encourage cultural exchange between domestic and Saudi Arabian students. Furthermore, through the consistent application of this study to policies at UW-Stout, we will likely see this exchange of cultural ideas and practices thrive.

A major motivation for conducting this research derived from the realization that as citizens of a nation we are subsequently hosts and hostesses. It is important to maintain a degree of social responsibility in this sense. The reputation of America and American citizens can either be lifted or degraded. Furthermore, this study is based upon the idea that through strengthening positive international relations we all benefit. Although, at times it can seem that international relations are only impacted by official diplomatic interaction, it is very likely that the individual citizen and the particular American academic institution can strengthen these bonds.

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Seasonal trends in permanent and ephemeral wetland water chemistry

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ABSTRACT

We investigated seasonal differences in pH, conductivity, and dissolved oxygen concentrations between permanent and ephemeral wetlands within the Chippewa Moraine State Recreation Area. These chemical attributes affect which organisms can live within these different habitats. We used general linear models to compare the effects of wetland type (ephemeral vs. permanent) and temporal variation on the water chemistry attributes. Specific conductivity was significantly higher in ephemeral wetlands than permanent wetlands, with no significant change over the growing season. Dissolved oxygen was significantly higher in permanent wetlands, but significantly decreased among sample periods in both wetland types. There was no significant difference in pH between permanent and ephemeral wetlands, but pH showed significant fluctuation between sample periods. Similar fluctuations were observed between the two types of wetlands over time. Ephemeral wetlands exhibited a higher specific conductivity and temperature which is likely due to their small size. pH fluctuations between sample periods may be affected by vegetation or soil conditions. The hydroperiod of a wetland seems to be an important factor affecting water chemical characteristics. Our findings provide a framework for investigating relationships between these water chemistry trends and biological communities.

Keywords: ephemeral ponds, wetlands, water chemistry

INTRODUCTION

Wetlands supply numerous ecosystem services such as regenerating polluted waters, preventing floods, protecting shorelines, and restoring groundwater (Mitsch and Gosselink, 2007). Wetlands also provide critical habitat for threatened and endangered species, including birds, plants, amphibians and insects. Despite their importance wetland losses still continue; 62,300 acres were lost between 2004 and 2009 (US Fish & Wildlife Service, 2011). Understanding wetland characteristics is critical for making sound management and conservation decisions.

The exact definition of a wetland varies among aquatic ecologists because wetlands often experience a gradient of habitat permanence, from

ephemeral to permanent. While permanent wetlands sustain water year round, ephemeral wetlands dry up seasonally. Colburn (2004) defines ephemeral wetlands as small bodies of water that are close to or within wooded areas that typically dry annually or every few years during the summer months and lack established fish populations. Ephemeral wetlands are a unique habitat because they exhibit characteristics of both terrestrial and aquatic systems (Dodds, 2002).

We investigated three water chemistry variables: dissolved oxygen (DO), specific conductivity and pH. DO significantly impacts species diversity in wetlands (Welborn, Skelly, & Werner, 1996). Some species acquire oxygen from the water surface, while others obtain oxygen through diffusion over gills or body surfaces (Colburn, 2004). pH is a measure of free hydrogen ions in the water and determines the acidity or alkalinity of the water. Conductivity measures the concentration of dissolved ions or salts in waters. Gonzalez, Drazen, Hathaway, Bauer and Simovich (1996) determined that salt concentrations and alkalinity play a role in species distribution, and these three characteristics of wetland water chemistry appear to be important factors influencing the wetland biological community.

Water chemistry varies throughout the year due to many factors including changes in weather, groundwater flow, vegetation and planktonic species activity. Dissolved oxygen (DO) tends to be higher at lower temperatures, which may be why insects emerge from pools in the early spring (Colburn, 2004). Most ephemeral wetlands exhibit low conductivities, and conductivity and pH tend to increase as the wetlands dry (Colburn, 2004). Ephemeral wetlands have larger fluctuations in water chemistry due to precipitation, evaporation and dilution (Bronmark & Hansson, 2005). Evaluating water chemistry of wetlands, specifically pH, dissolved oxygen, and conductivity allows us to better understand the potential to support primary productivity and high species diversity of the habitat.

Photosynthesis and respiration have an impact on both pH and DO. Photosynthesis consumes CO₂, increasing the pH by reducing the amount of CO₂ in the form of carbonic acid (Bronmark & Hansson, 2005). Respiration decreases the pH and DO as organisms consume O₂ and release CO₂. Wetlands that have less canopy cover have higher photosynthetic activity and less leaf litter or detritus (Colburn, 2004). Detritus in the system causes respiration to exceed photosynthesis, leading to a decrease in DO (Bronmark & Hansson, 2005). Permanent wetlands have a larger surface area exposed to sunlight thus promoting photosynthesis and oxygen production.

The purpose of this project was to gain a better understanding of water chemistry within permanent and ephemeral wetlands. We investigated changes in water chemistry over the course of a growing season and compared ephemeral and permanent wetlands. We hypothesized that conductivity would be higher in the ephemeral wetlands and dissolved oxygen and pH would be higher in the permanent wetlands. Conductivity and pH were expected to increase over the season and dissolved oxygen was predicted to decrease as the temperature increases.

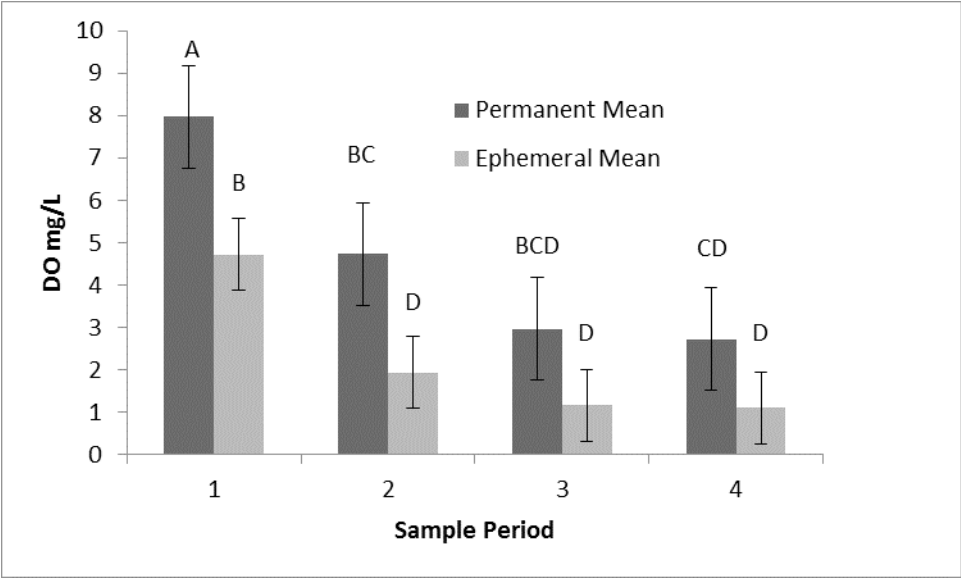
METHODS

We studied 57 wetlands in the Chippewa Moraine State Recreation Area in Chippewa County, Wisconsin (45° 13' 13.32" N, 91° 24' 39.7" W). The study area was heavily wooded and contained many natural wetlands and lakes formed by the glacial moraine. 57 wetlands were sampled and of these and of these, 41 were classified as ephemeral and 16 were permanent. The water chemistry of the wetlands was measured over four sampling periods from May to August 2013 (period 1: 7-15 May, period 2: 3-10 June, period 3: 1-9 July, period 4: 29 July - 1 Aug). pH, specific conductivity, and dissolved oxygen (DO) concentrations were measured at three sampling areas within each wetland to account for within-wetland variability. DO was measured with a YSI ProDO® meter and pH and specific conductivity were measured using an Oakton PCTestr 35® field meter. pH was calibrated daily and conductivity and DO were calibrated weekly. The mean of the three samples within each wetland was used to inform statistical analyses. We used general linear models to determine differences between class (ephemeral vs. permanent) and sample period. We used Tukey's HSD post-hoc to test significant difference between the means.

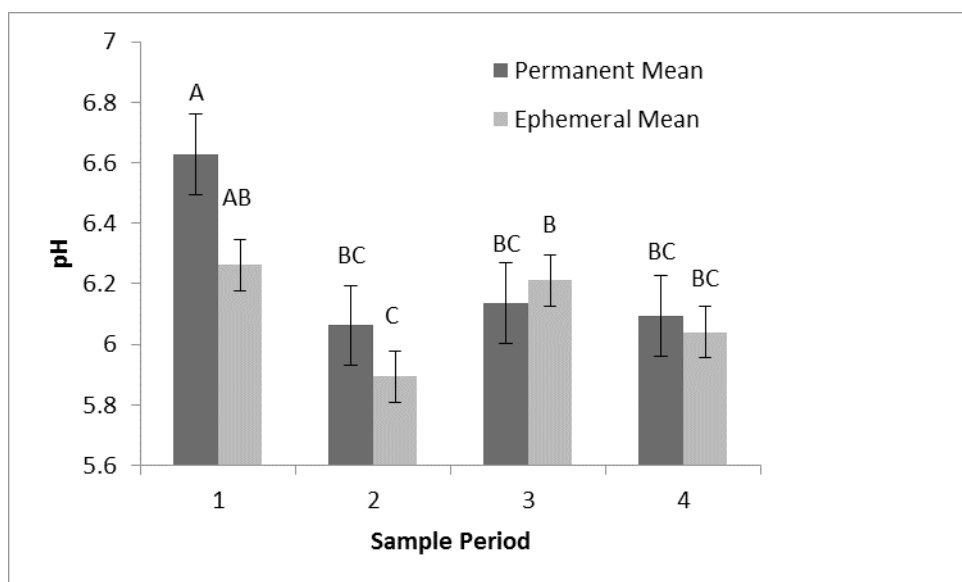
RESULTS

DO was higher in the permanent wetlands (mean $\pm$ S.E. = 7.96 ± 1.88 mg/L) and decreased over the season to a mean of 2.11 ± 1.45 mg/L. Ephemeral wetlands generally had lower DO values than permanent wetlands, but both followed a similar decreasing trend over the four sampling periods (Figure 1). In ephemeral wetlands, DO began at a mean of 4.71 mg/L and steadily decreased to 1.1 mg/L over the course of the growing season (Figure 1). DO was significantly higher ($P < 0.001$, $F_{1,189} = 33.93$) in permanent wetlands and significantly decreased between sample periods, regardless of wetland type ($P < 0.001$, $F_{6,189} = 25.05$). Permanent wetlands also exhibited a wider range of values: 0.367 - 12.7 mg/L compared to 0.233 - 10.9 mg/L in ephemeral wetlands.

FIGURE 1

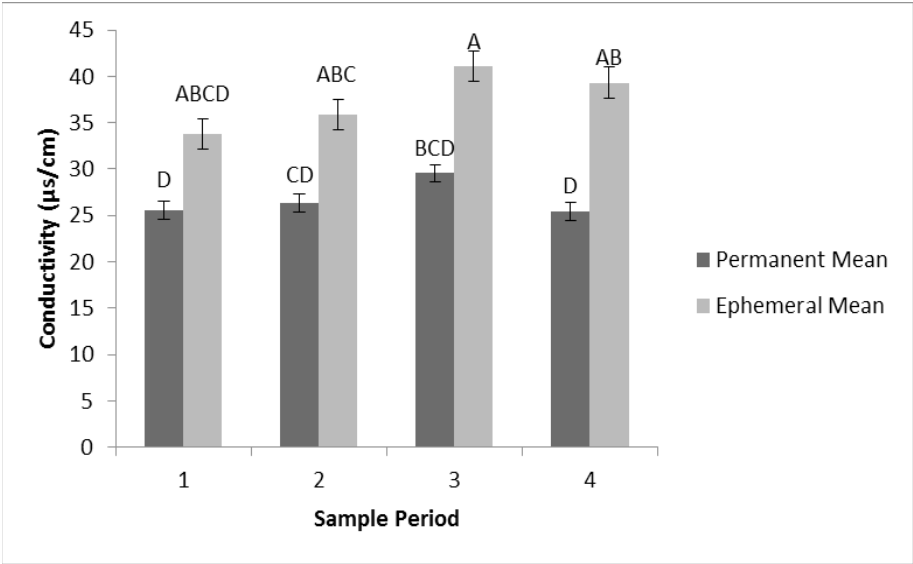


Compared to DO, pH was relatively consistent throughout the season in both ephemeral and permanent wetlands. Overall, permanent wetlands displayed a higher mean pH with the exception of sample period three where the ephemeral wetlands displayed a higher mean pH (Figure 2). The mean pH of both types of wetlands decreased over time. A general linear model determined no significant difference between wetland types ($P = 0.078$, $F_{1,189} = 3.13$), but there was a significant difference between sample periods ($P < 0.001$, $F_{6,189} = 5.85$) due to higher values in the first sample period and lower values in the second sample period (Tukey's HSD post-hoc test). There was a weak negative linear relationship between DO and temperature in both the permanent ($P = 0.267$, $y = 6.647 - 0.1217x$, $R^2 = 0.02$, $F_{1,132} = 1.25$) and ephemeral wetlands ($P < 0.001$, $y = 5.507 - 0.2009x$, $R^2 = 0.097$, $F_{1,132} = 14.21$), but the relationship was only significant in ephemeral wetlands.

FIGURE 2

In general, specific conductivity was higher in ephemeral wetlands than permanent wetlands and it gradually increased during the summer (Figure 3). Conductivity in permanent wetlands was the same during the first and last sample period with a mean and standard error of $25.5 \pm 2.86 \mu\text{S}/\text{cm}$ (Figure 3). There were significant differences in conductivity between ephemeral and permanent wetlands ($P < 0.001$, $F_{1,189} = 29.68$). However, there were no significant differences between sampling periods ($P = 0.062$, $F_{6,189} = 2.05$). Ephemeral wetlands displayed a wide range of conductivities and were highly variable compared to permanent wetlands.

FIGURE 3



DISCUSSION

DO decreased throughout the season as predicted; however, DO in permanent wetlands displayed unexpectedly high variation. Like Colburn (2004), we found that increasing temperature in the ephemeral ponds related to the decreasing DO concentrations. The higher DO in permanent wetlands may be explained by the larger surface area in contact with sunlight which promotes photosynthesis and the production of oxygen. Lower DO levels would require that organisms living in shallower ephemeral wetlands be adapted to tolerate lower oxygen concentrations. The significant decrease in DO over the season may contribute to the significant change in macroinvertebrate community composition that occurs in ephemeral wetlands (Tarr, Baber & Babbitt, 2005). pH and conductivity trends contradicted our original predictions. Overall, the pH was similar between the two wetland types. pH was not as variable as DO or specific conductivity, suggesting that organisms living within wetland habitats may tolerate only minor shifts in pH. However, the reason for pH fluctuations between sample periods may be due to biotic factors such as vegetation type or abiotic factors such as interactions with minerals in the underlying soil. pH was expected to increase over the course of the growing season due to submerged vegetation absorbing carbon dioxide from the water, but instead the pH decreased and became more acidic. The decrease may be due to outside sources such as runoff, vegetation surrounding the wetlands or soil type. In addition, rewetting of soil organic

matter and breakdown over the course of a growing season in temporary wetlands releases organic acids and carbon dioxide, potentially lowering the pH (Kim, Vargas, Bond-Lamberty & Turetsky, 2012). Permanent wetlands may have had the same mean in the first and last sampling periods due to the water level remaining reasonably constant.

The conductivity and pH values in our study are comparable to a survey of Minnesota ephemeral wetlands, which reported a mean pH of 6.5 and a range from 5.57-7.6 (Batzer, Palik, & Buesch, 2004). Our range was 5.07-7.97 and the mean of ephemeral wetlands was 6.26 (± 0.06 SE). Batzer et al. (2004) also reported a mean conductivity of 82.6 $\mu\text{S}/\text{cm}$ and a range of 24-390 $\mu\text{S}/\text{cm}$. Our conductivity was on the low end of this spectrum with a range of 13.0 - 82.7 $\mu\text{S}/\text{cm}$ and a mean of 33.8 $\mu\text{S}/\text{cm}$ (± 1.5 SE). Low conductivity values may indicate that our wetlands are fed mostly by precipitation and that groundwater influx from the nearby wetland soil does not contribute many ions to the wetland waters (Little, Allen, & Guntenspergen, 2005).

This study could provide insight for future conservation efforts such as reconstructing ephemeral wetlands to sustain species diversity. Information on water chemistry can provide insight into the conditions different species can tolerate and the influence of water chemistry on ecological community development in the different wetlands. The hydroperiod (water level changes and duration) of a wetland is an important factor affecting chemical composition of the wetland water, and our findings provide a framework for investigating relationships between water chemistry and biological communities in the future.

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Social Networks of University Students with Mental Illness

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ABSTRACT

Previous research shows that negative perceptions of mental illness can cause social distancing and negative perceptions of self. Friendships are one social support that helps to fight these negative effects. This research attempts to understand friendships and support systems for university students with mental illness, including why such support and friendships are pursued. In-person interviews of students with mental illness and their friends, along with a survey based social network analysis, help to create a clearer picture of who students with mental illness are creating these relationships with and why. This study shows that the friendships of individuals surveyed were based upon homophily: physical (age and gender) and social similarities (mental illness, interests, and values). Not found in previous literature, but shown in this small study, is that connectedness of non-mentally ill individuals was higher within their social networks compared to social networks of individuals with mental illness. This study also found that mental illness could affect moods occasionally, but their friends often saw the symptoms of the people with the mental illnesses in this study as positive attributes of the person with the mental illness.

Key Words: Mental illness, social networks, friendships

Social Networks of University Students with Mental Illness

The prevalence of mental illness on college campuses is substantial. A 2011 study stated that 12-18% of students on college campuses in the United States have a diagnosable mental illness (Cleary, et al., 2011). Friendship and positive mental health (happiness) has a strong correlation (Forrester-Jones et al., 2012). This project sought to find more about students on the UW-Stout campus with mental illness and their own social networks. This study explicitly questions: To whom do people with a mental illness go to for social support? How do they feel supported? Do people with a mental illness or friends of people with a mental illness feel the illness affect the friendship? The research hypothesized that individuals who had or currently have a mental illness develop friendships with similar individuals, have multiple benefits through social support and social networks, and that the illness is not

seen as a dominant component of the friendships. This concurrent exploratory research used previous research, the Rational Choice and Basic Needs theories, qualitative data, and quantitative data to explore the social networks of students with mental illness on the UW-Stout campus.

Literature Review

Befriending someone with a mental illness is not seen as ideal in society. Perceptions of mental illness lead to social distancing of people with mental illnesses, often in a hierarchical order according to the condition (Gordon et al., 2004). In one study 60% of the participants stated that they did not want to be in a sexual or romantic relationship with someone who had a mental illness, seeing the condition as burden on the relationship (Elkington, et al., 2013). A mental illness that is more acute tends to hold less stigmatization, while a condition seen as long-term holds more stigmatization. However, a decrease in stigma does not necessarily mean complete approval or acceptance of the illness (Mak et al., 2014).

Societal perceptions of mental illness play a role in how individuals with a mental illness perceive themselves. Individuals with a mental illness often feel that they are less desirable to have relationships with because of the stigmatization it holds (Elkington, et al., 2013). The illness causes a sense of loneliness and an inability to connect to others, intensified with severity of the condition, increasing the difficulty for a severely mentally ill individuals to maintain and create friendships (Chernomas, 2008). People with a milder mental illness tend to have larger social networks compared to those individuals with severe mental illnesses (Chernomas, 2008).

A high regard for friendships and social networks show increased likelihood to reject social stigmas. With the increased rejection of stigmas, individuals become more resilient to the negative impacts (Rüsch et al., 2009). Chernomas (2008) described the life of someone with a mental illness in this way: "Good support can often mean the difference between living a satisfying and fulfilling life and living alone with the burden associated with mental illness." When the stigma of an illness is reduced within a valued group of friends or social network, self-stigmatization is also reduced (Rüsch et al., 2009) leading to an increased self-esteem (Forrester-Jones et al., 2012).

A decrease in patient delay in patients receiving professional help is increased with more social support (Pedersen, et al., 2011). The benefits of friendship also aid in recovery from a mental illness (Parker, 2004). Social networks are vital to self-esteem, quality of life, and mediating social functioning (Forrester-Jones et al., 2012). Friendship, described as a strong social network, is a voluntary tie developed over time between two people; it

involves support, intimacy, companionship, and reciprocity (Demir & Davidson, 2013). Through friendships, a person learns reciprocity, leading one to believe that he or she is cared for, is valued, and belongs to a friendship with mutual obligations (Pernice-Duca, 2010). Friendships allow for increased confidence socially when friends' responses make the person feel understood, validated, and cared for (Demir & Davidson, 2013). Satisfying and positive friendships are linked with protective factors for psychological and physical well-being, and happiness (Rabaglietti al., 2012). People are more likely to be friends with people who are similar to themselves, often-sharing attitudes, values, and interests (Blieszner, 2014). Much has been studied in how the benefits of friendships help decrease the chances of mental illness symptoms, encourage use of therapy or medical help, and how friendship can aid in recovery of an illness. However, little has been studied on how both friends of someone or someone with a mental illness perceive the illness actually affecting their friendship. There is also a lack of literature on whom people with mental illness include in their social networks and how they personally feel supported by these networks. This research sought to further explore those gaps in research of mental illness social networks.

METHODS

Participants

The stigma of mental illness causes many individuals to hide the fact that they have a condition. Because of the secrecy of the topic, this research was used more as an exploratory concurrent mixed methods research project of university students. The research found in this study was a pilot that may be used for further more extensive research.

The researcher sent out Qualtrics surveys to 27 UW–Stout students with a known mental illness. The initial interviews and surveys were sent to people known with a diagnosed mental illness within the researcher's social network, and the snowballing effect was used to obtain more participants. Mental illnesses in this study included attention deficit disorder (ADD), attention deficit hyperactivity disorder (ADHD), depression (seasonal, chronic, situational, etc.), obsessive-compulsive disorder (OCD), anxiety, psychotic symptoms, bipolar disorders, alcoholism, drug addiction, 'other' addiction, and eating disorders. A total of 11 surveys were used out of 27 opened surveys. The ages of the survey participants were from 21 to 23 years old, with one 24+ year-old participant. Participants identified as having ADD (three), ADHD (two), depression (seven), OCD (three), anxiety (eight), and/or an eating disorder (two). Qualitative data was also used. Five friendships, each with at least one person with a mental illness, were interviewed in person. In

three of the five friendships, both the interview participant and the friend of the participant had a diagnosed mental illness. The interviews included nine females and one male (ages 21 to 23 years old), who had the following mental illnesses: depression, perfectionism-anxiety, generalized anxiety, or ADD. The in-person interviews were approximately 20 minutes each.

Procedure

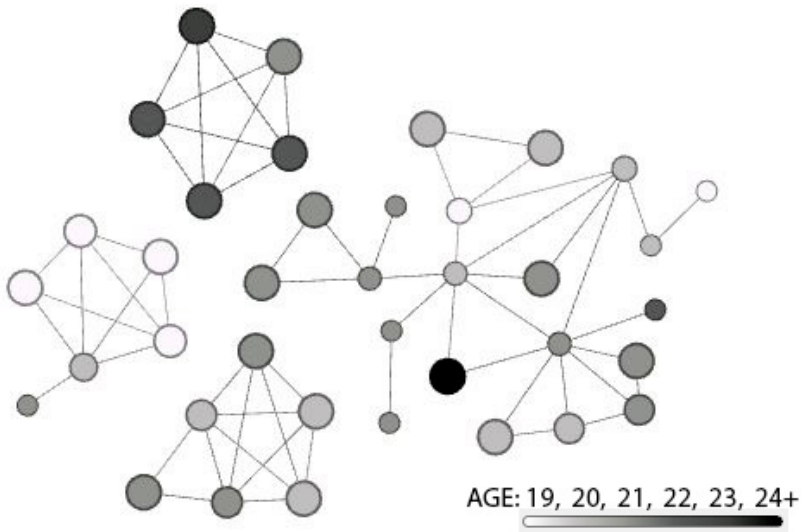
Participants either had to confirm their consent via online by clicking an arrow, or sign a consent form in-person to participate in the survey and interviews. The surveys were sent out via email and were completed online. The interviews were in-person and recorded using the sound recorder application on the researcher's laptop. The questions on the surveys given to participants included: demographic questions, illness type, activities done with friends, types of support systems, and social networks of friends (with or without a known mental illness to the participant) with friend demographics. The questions asked in the interviews included: demographics, illness type, evaluations of friendships, types of support systems, how mental illness affects friendships, and comfortableness with discussion of mental illness.

Participants who took the survey and participants' network connections were labeled with numbers to hide identities. Participants in the interviews were given pseudonyms to hide identity. The data was coded to evaluate similarity in friendship, perceived impacts of mental illness on friendship, friendship-provided support, and connectedness of social networks. Surveys were analyzed with Gephi by creating a social network. Using the clustering coefficient from the Gephi data as the dependent variable, age, gender, and whether someone had a mental illness or not as independent variables, a linear regression in SPSS was used for analysis.

RESULTS

Similarity of the people in friendships played a vital role in friendships studied. All participants interviewed were of similar ages, usually only varying one year apart. This is displayed in the social network below (Figure 1). Most of the networks portray that people tend to have social networks with similar-aged people. In the largest network there is a completely black dot designating an older respondent. The black dot is a survey respondent's boyfriend, which may play a factor in why he is older than most in the network.

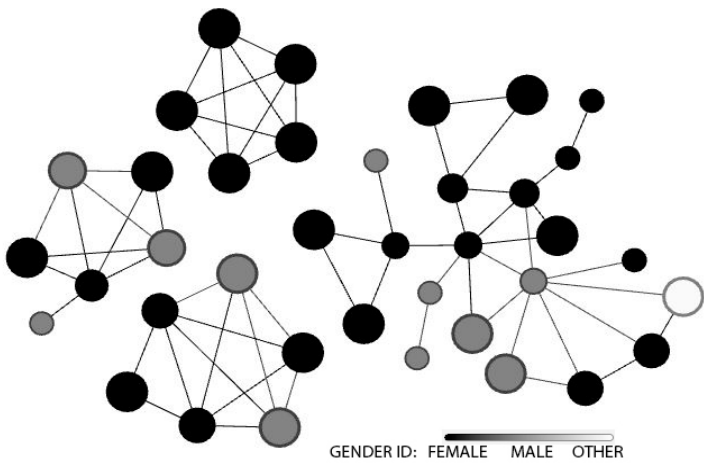
FIGURE 1



Social Network Display of UW-Stout Students with Mental Illness - Age

Four out of the five interview participants picked friends to interview with them, who were of the same identified gender, and the fifth participant's friend identified as a "feminized male," suggesting again similarity in gendered friendship relations. Figure 2 displays this gendered social network pattern.

FIGURE 2



Social Network Display of UW-Stout Students with Mental Illness - Gender

The participants in both the interviews and surveys identified shared interests, activities, and social values with their friends. Cathy stated, "We share the same values, morals, and beliefs," as a reason for their friendship. Another friend described how she initially and continues to be connected with her friend, "He loves NPR. I love NPR. We just liked outdoor activities and hanging out, so we started doing those kinds of things together and still do." One interviewee said, "We both have a similar lifestyle," while the other friend replied, "We both don't give a shit."

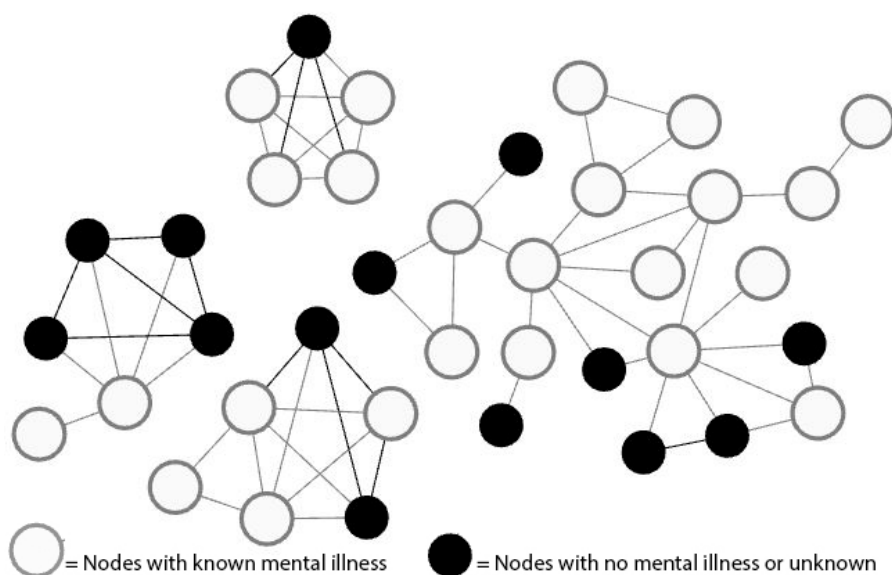
FIGURE 3**Social Networks of UW-Stout Students with Known Mental Illness(es) and Friendships**

Figure 3 displays the connections of the friendships in the survey taken. Those surveyed often had connections with other people who had a known mental illness. The white nodes (24 nodes), representing individuals with a known mental illness, are more common than the black nodes (14 nodes), which represent the individuals with no diagnosed mental illness (or it was unknown if the individual has a mental illness). This shows that people with mental illness in this research often had friends who also had a mental illness within their social networks.

TABLE 1

	B	P-Value
Mental Illness ¹	-0.408	0.013
Age	-0.058	0.315
Gender ²	-0.281	0.057
R Square	0.187	0.01

1: Reference group: No mental illness
or mental illness of friend is unknown

2: Reference group: Male

Source: Social Network of Mental Illness Survey of UW-Stout Students

Table 1: Regression Statistics for Chances of Mental Illness and Clustering Coefficients

Regression statistics for having or not having a mental illness and the variation in clustering coefficients offer further insight into social networks of those with a mental illness (see Table 1). A linear multivariate regression was used, coding mental illness as 1 and no mental illness or known status of mental illness as the dummy variable as 0. For individuals with a known mental illness, compared to individuals with no mental illness or unknown status of the individuals having an illness, the clustering coefficient decreases by .408 when controlling for gender and age, significant at the .05 level. With an R square of .187, 18.7% of the variation in the DV can be explained, significant at the 0.01 alpha levels. Age and gender were not significant predictors of clustering coefficients at the .05 level, even though these were expected attributes of clustering, due to Figures 1 and 2. This regression model suggests that mental illness is a particularly significant clustering attribute among university students surveyed.

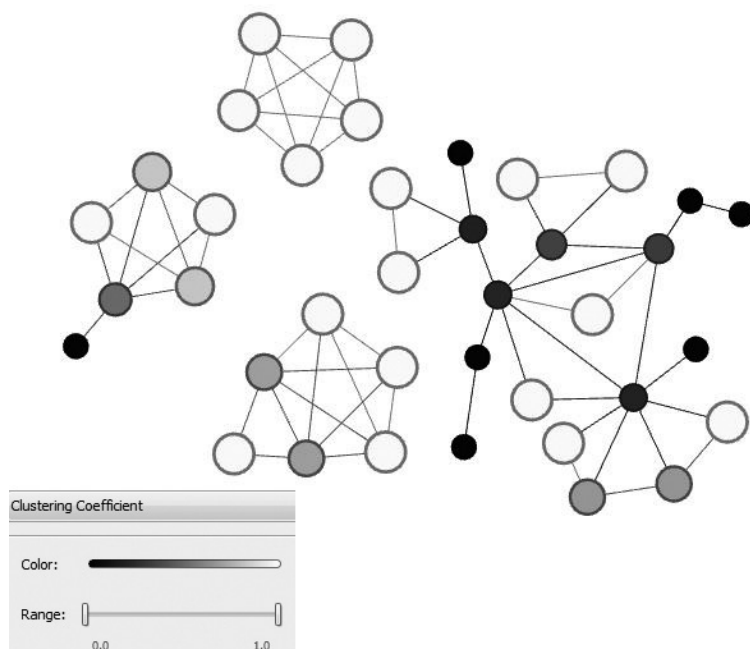
FIGURE 4

Figure 4 gives a more visual display of the clustering coefficient distribution among survey participants and their social networks. A whiter node represents a higher clustering coefficient. The clustering coefficient compares the potential triadic closures to the actual amount of triadic closures on a scale of 0 to 1. The closer to 1, the more that one's immediate social network connection is connected to one another. The closer to 0, the more that one's social network connection is not connected to one another. The topmost social network was the network that was most tightly connected with perfect triadic closures with everyone in the network. The black nodes were less perfectly connected with everyone in their network.

Friendship Provided Support: Time Spent, Reciprocity, Encouraging Professional Assistance, Discussion of Illness, and Overall Acceptance

According to the survey responses, 64% of people (7 out of 11) said that spending time together is the way they feel most supported by friends in dealing with their mental illness (see Table 2). People interviewed made an emphasis on the importance on time spent together as well. Abby stated, "She's always there for me and we hang out a ton." However, Cathy also discussed how her friend would be there for her, even if they don't spend time

together constantly:

She “checks-in” with me, if I haven’t seen her in a while, and she makes time for me. Whether it’s for something important or not, she always makes time for me.

TABLE 2

#	Answer	Response	%
1	Encouragement to receiving mental health help from a professional	6	55%
2	Answering messages/calls when needed on short notice	4	36%
3	Not knowing about or discussing your mental illness	1	9%
4	Spending regular amounts of time together	7	64%
5	Helping with chores, homework, other activities	2	18%
6	They tell you what is troubling themselves	6	55%
7	Never mentioning your illness, even though they know about it	3	27%
8	Other	1	9%
9	Other	1	9%

Table 2: Answer variation to survey question: “How do you feel most supported by your friends concerning daily life and dealing with your mental illness?”

Reciprocity tended to be an important factor for friendships. 55% of participants in the survey marked that hearing a friend’s troubles is one way that they themselves feel supported. Gabby explained, “If you’re my favorite, I want to be your favorite,” and went on to describe, “She lets me feel equally loved.” Encouragement to receive mental health help from a professional was the second most selected answer in the survey (55%) for the question regarding how individuals with mental illness feel most supported by friends.

Discussion of mental illnesses within friendships varied. One person in the survey, and two interviewed, stated that one of the top ways they feel supported was through friends not knowing of or discussing their illness. Three people chose that they feel supported by never mentioning their illness, even when their friends know about it. For example, Abby knew that Gabby had a mental illness, but did not know the actual diagnosis and never felt the need to bring it up:

She (Abby) supports me sometimes by not even talking about it and that’s not because I want it to be hidden. It is a part of my life and who I am, but sometimes if I just focus on how I struggled with depression it makes it snowball and escalate. I think just being there and listening to specifics means more to me then bringing up the fact that I have depression and just wallowing on that. If I know someone who has been affected by depression then I might bring up the specific topic of depression, but otherwise, just the symptoms because those people who haven’t experienced it might have a harder time understanding it.

Glen, who did not tell Gabby of his illness until the interview, explains why he also would talk about specific situations of symptoms rather than the mental illness itself:

I talk about it (perfectionism anxiety and depression) with my parents and brothers. Select friends I share the symptoms with a lot, but I rarely ever share the actual diagnosis with people. The words seem to bring expectations and assumptions I like to avoid. I hate that it is a diagnosis, so usually I talk about symptoms or emotions.

It was a common theme between the interviewees that the mental illness's specific name was not brought up in conversations between the friends who were interviewed. Instead the individuals would bring up symptoms of the illness they were experiencing for emotional or social support from their friend.

Additionally, people with a mental illness felt supported by friends, by simply feeling accepted for who they were as individuals. Although, acceptance of oneself was not an option on the survey, for an example of friendship support, one individual felt strongly enough about it that they included it in the "other" section, writing in, "being accepting of my values and life even though they might not always be comfortable with it." In the interviews Dorothy explained how she felt accepted by Cathy and that made her feel supported: She understands me, and loves and accepts me regardless of the circumstances or condition I am in. She is trustworthy and someone I can confide in. She's the most non-judgmental person I know. She has a way of listening to me that really makes me feel loved and important.

Perceived Impacts of Mental Illness on Friendship

During the interviews, the individuals were asked if they perceived the mental illnesses as a significant factor in their friendships. Friends of the interviewees with a mental illness and interviewees with a mental illness tended to reinforce the idea that a mental illness is not seen as a significant factor in their relationships. Gina, who has ADD and is friends with Zina, who also has ADD, explained that one possible negative factor of ADD, is more related to prescription medication, rather than the actual illness:

Only in terms of medication because of the bad side effects, like people lose weight, more anxious, more on edge, agitated a lot, hyper focus and not as personable. You're just not yourself. You're not as fun to be around. I've even heard of people even having decrease in sex drives because of it. I honestly don't think it (having ADD) matters though. We live with each other, but we don't live with each other's mental illness. And I think that Zina's ADD honestly makes her more fun to be around sometimes because it can help to make her that much wilder and fun.

Glen's friend did not know before the interview that Glen had been diagnosed with perfectionism-anxiety. When asked how the mental illness is seen as affecting the relationship Glen's friend responded:

Now that I know what it is, he has described his symptoms to me. I am shocked that some people may see it as an illness. I always was actually inspired by his drive that may be part of his 'illness.' I love him for him. I don't think he is controlled by his illness. It doesn't define him or our friendship. He's just himself and he's great.

Cathy described how she felt, in a way, her friendship benefited from Dorothy's anxiety disorder: I don't think it affects our friendship at all, really. Dorothy is a huge planner and likes to know when and where things are happening. When she doesn't have information like this her anxiety will kick in a little bit. So, if anything, it's helped her planning skills, so I always know when and where I'm going to see her. It's nice for me with my busy schedule, and I like to stay organized. Remarks from people with a mental illness and their friends in this study show how a mental illness is not viewed as a significant factor in friendships. Symptoms of the medication may negatively impact the friendships occasionally, but overall the mental illnesses were not perceived as a negative factor in friendships. Friends viewed some of the symptoms of the mental illnesses as their friends' positive attributes.

DISCUSSION

The study hypothesized that participants with a current or previous mental illness develop friendships with individuals who are alike. The results found that individuals in the study tended to be of similar age and gender identities. Similarities in personal values and interests, such as indoor rock climbing, shopping, etc. were all seen as a part of how friends created and maintained their relationships. Individuals in the social networks revealed as having many close connections to others with a known mental illness, known because the friend in the social network revealed the illness to the participant. However, each network had at least one individual who did not have a diagnosed mental illness, according to the survey taker. People may keep others with a mental illness in their networks because they may relate better to those people, and be able to discuss their illness more freely between friends who also have similar conditions. The social networks also showed friendships between people with a mental illness and no known mental illness. There are interesting dynamics that create less in-group orientation among those with mental illness compared to those without. The finding of similarities among friends is common with past research that states that friends are more likely to be friends with people who are similar to them, but different

enough to maintain individuality (Blieszner, 2014).

When compared to individuals with no mental illness, or if the status of a mental illness was unknown, an individual with a mental illness in this study tended to have fewer people in their social networks that were connected to one another. This means that these friends are not getting together to create strongly interconnected social networks; individuals with mental illness were more dependent on individuals from a variety of different social networks, rather than a solid group of friends for support. This was not found in previous studies; future research on a larger and more diverse population should explore this dynamic further.

The research also hypothesized that individuals experience multiple benefits through friendships and social networks. Previous research shows that psychological needs often can be satisfied with friendship, in accordance to the Basic Needs Theory, which states that in order for someone to meet their psychological needs the person must feel autonomy (initiating one's own actions, feelings of agency), competence (feelings of efficacy and being capable), and relatedness (feeling connected and cared for by others) (Demir & Davidson, 2013). Friendships in this research meet the three basic needs in a variety of ways, helping with the psychological well-being among participants. The research found that participant's valued time spent with their friends and friendship reciprocity. The research also found that friends of individuals with mental illness were able to encourage professional mental health help, and that the individuals with the mental illness felt that this was a way in which their social networks or friendships helped support them when dealing with their mental illness. Previous research also found that with the more natural or social support from their networks a person had, the more likely that professional mental health services were to be used, and that professional and natural support systems may be interdependent on one another (Tsai et al., 2012).

This paper's research also shows that, although discussion of the actual mental illness was often not predominant in relationships because of fear of social stigma, that individuals with mental illness still benefitted and felt supported through emotional support by discussing specific symptoms of the illness instead. This is consistent in research of benefits of friendships and helping with certain stressors, as the relationships with others help to create stronger positive personal adaptations and act as cushions to such stressors (Boydell et al., 2002). People in this study with a mental illness are steering away from certain labels and now moving to symptom-based descriptions of mood. The reason for steering away from the labels could be explained by the economic theory called Rational Choice Theory, which states that

people weigh the benefits and cost to maximize their utility. The costs in this case would be the negative stigma of bringing up a mental illness to a friend. Sometimes the cost of the negative stigma and judgment of bringing up the actual illness to friends, even with friends that are considered to be extremely close, does not outweigh the benefits. Instead, only symptoms are brought up. Along with social and emotional support, participants tended to feel supported in their friendships when their friendships allowed for freedom of expression and acceptance of self. This corresponded with past research that found individuals respond better to social outcomes if validated, understood, and cared for by friends (Demir & Davidson, 2013).

The research also concluded that regardless of the stigma of mental illness within society, encouraging social distancing of those with mental illness, that mental illness with the friendships interviewed was not seen as a significant negative factor in the relationship. This study showed that individuals who were interviewed often saw symptoms of the mental illnesses in their friends as positive. This matched the hypothesis that the illness was not seen as a dominant component of friendships with people who had a mental illness. Furthermore, this study showed that those with mental illness had friends who were not likely to be tied to one another, compared to those without mental illness, which also supports the initial hypothesis. Elkington, et al., found a similar result of individuals not feeling that the mental illness affected romantic or sexual relationships, but only within the population that had non-psychotic symptoms as the population studied with psychotic symptoms stated that they believed the mental illness did indeed affect their relationships negatively (2013).

CONCLUSION

Friendships of individuals surveyed were based upon physical (age and gender) and social similarities (mental illness, interests, and values). Shown in this exploratory social network, is that connectedness of non-mentally ill individuals was higher within social networks compared to social networks of individuals with mental illness. This study also found that mental illness could affect moods, but the symptoms of the people with the mental illnesses in this study were often seen as positive attributes of the person with the mental illness. Regardless of mental illness or no mental illness, friendships are shown here as a voluntary tie involving affection, companionship, trust, and reciprocity with people that simply enjoy and accept one another. However, further insight should be done on a larger population of friendships, while also focusing the connectedness among friends of mentally ill university students, as well as why those connections exist.

Future research should also be done to explore a larger sample, including more severe mental illnesses and their social networks as well. Longitudinal studies of different casual friends, "best" friends, or friends with other mental illnesses of social networks could be looked at as well to try and consider what kind of support is best for different types of mental illness. This study finds that social networks are important to everyone, but particularly so for helping those with mental illness. However, this study also suggests that research on patterns of connectedness in social networks for people with mental illness is important to tease out, particularly why those networks look the way they do.

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An Unsuccessful Empirical Study of Problem Solving Via Concept Mapping

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ABSTRACT

This pedagogical study explores the problem solving technique of concept mapping (CM) as opposed to word problem solutions in operations and supply chain management. Concept mapping (CM) is a relatively common technique in the instruction of complex concepts, but not in CM and especially not in operations management problems.

This study evaluates the unsuccessful comparative benefit of problem solving concept mapping (PCM) versus the conventional word problem presentation in solving nine actual operations management problems.

The evaluation was done over a semester in the operations management classroom at the University of Wisconsin-Stout. The class consisted of juniors and seniors in the Business and Operations Management Departments. Although the study exhibited negative results, it is important to provide academia with both positive and negative outcomes to balance the pedagogy of the subject. It is believed that the more complex the problem, the greater the advantage of concept mapping.

INTRODUCTION and LITERATURE SEARCH

The term "concept mapping" (CM) is used frequently in the pedagogical approach to explain complex concepts (Vacek, 2009, p.45-48). This paper, however, is focused on concept mapping in problem solving (PCM) for operations management issues. Applications in problem solving are relatively new (Giddens, 2006, p.45-46). CM has been used extensively in the health care industry (Chen, Liang, Lee, & Liao, 2011, p.466-469), but the literature review did not reveal that it is commonly used in operations management applications.

Benefits of CM and PCM

Whether the technique is used in explaining a complex issue or, as a problem solving tool, it provides a graphic representation of the issue. The issues may be a result of a kaizen effort (small process improvement recommendations by employees), or even of a six sigma finding. Visual support (Gurlitt & Renkl, 2010, 417-433) affords a unique perspective to the solution. A similar concept is historically affirmed in earlier elementary education stud-

ies ("Teaching Young Children", 2011, 10-13) where it has been proven that children perceive pictures better than words.

Parallels to CM and PCM

Similar visual approaches were precursors to the concept map development. A simplistic example is in the use of "chunking" (Perlman, Pothos, Edwards, and Tzelgov, 2010, 649-661) i.e., the clarification of remembering XyyXyXX versus XXXXyyy due to the ordering of symbols. It is also understood in memory techniques whereby long concepts are placed in familiar, visual "rooms" (Moonwalking with Einstein, Joshua Foer, 2011). It is demonstrated that in the study of organic chemistry, stereochemistry displays are more descriptive than non-stereo diagrammed chemical formulas. A picture is worth a thousand words. Novak (Applied Concept Mapping, Novak et al., 2011) summarized the concept nicely. He further introduced a software approach to graphically demonstrate its use.

Benefits of PCM

A prime benefit of concept mapping is its development of critical thinking (Chen, Liang, Lee&Liao, 2011, 466-469) via pictures. The medical disciplines have surpassed the business industry in the benefits of the concept via diagnostic instructions (Daley & Torre, 2010, 1365-2923). General business has had some exposure to CM in teaching but little in PCM (Chei-Chang, 2006). Education is gradually utilizing the concept (Joseph,& Alberto, 2006,175-175) and replacing abstract thinking with visual learning (Hay, Kinchin & Lygo-Baker, 2008, 295-311). In all age disciplines, CM provides increased discussions as to the concept being studied (Imeson, 2011, 8-10). Even in lower grades, the approach has become of value (Gallenstein, 2005, 44-47).

Topic maps versus CM and PCM

Problem solving concept mapping must be distinguished from other graphic approaches, such as topic maps and mind maps which do not include calculations. A topic map, as shown in Image I, is a diagram for the representation and interchange of knowledge, with an emphasis on the ability to locate specific information.

This paper will explore the potential value of PCM in solving operations problems versus finding a solution by simply giving the word problem and equations.

METHODS

The methodology described below involves student surveys of each of the different problem solving approaches (standard vs. concept mapping). Each problem was alternated between groups to eliminate the influence of the specific group skills in general problem solving.

The methodology was as follows:

- 1. Sample size consisted of 60 junior and senior university students
- 2. Students' majors were diverse but in a poly-technical category
- 3. Ten different problems were administered over a semester (September-December)
- 4. Students were divided into two groups (A,B) via their alphabetical last name position
- 5. Identical problems were given to each group. However, when Group A received a regular problem description with possible equations to use Group B received a PCM with the appropriate decision tree and equations.
- 6. Answers were recorded on Desire to Learn D2L software.
- 7. The problems were operations' management type problems, as shown in Table I:

TABLE 1: Problem Types

Problem #	Problem type
1	Forecast
2	line balancing
3	learning curve
4	logistics
5	capability index
6	inventory turns
7	ordering
8	kanban
9	critical path
10	waiting line

1: Reference group: No mental illness or mental illness of friend is unknown
2: Reference group: Male
Source: Social Network of Mental Illness Survey of UW-Stout Students

An example (learning curve) of a regular problem versus a PCM problem follows:

A.Regular Problem (non-concept mapping)

Problem Category: Learning Curve

Important Information:

Unit # Cost

1. \$10,000
2. \$8,300
3. \$7,300
4. \$6,200
5. \$6,000
6. \$5,700
7. \$5,300
8. \$5,100

Problem:

1. What are the % learning curve characteristics?
 - a. Give answer in "%"
2. What are the estimated average costs for the first 500 golf carts?
 - a. Give answer as "average cost per golf cart"
3. What are the costs to produce the 500th golf cart?
 - a. Give answer in "\$ for 500th golf cart"

Input Data-Calculation Approach:

1. % learning curve calculation
 - a. % calculation of unit 2 divided by unit 1
 - b. % calculation of unit 4 divided by unit 2
 - c. % calculation of unit 8 divided by unit 4
 - d. Etc., now average the above calculations and divide by the number of calculations.
2. Average cost of "x" number of units
 - a. Use cumulative values table to obtain factor (learning curve % and # units that are of interest)= fc
 - b. (unit #1 cost)*fc (see above)
 - c. Divide the "b" answer by the # of units that you are interested in for the average/unit.

3. Cost to produce any particular unit

a. Using "unit improvement table" and the "% learning curve": (unit #1 cost) x (table value for that unit).

B. PCM

Problem Category: Learning Curve

Important Information:

Unit # Cost

1. \$10,000
2. \$8,300
3. \$7,300
4. \$6,200
5. \$6,000
6. \$5,700
7. \$5,300
8. \$5,100

Problem Solution via PCM:

1. What are the % learning curve characteristics?

a. Give answer in "%"

2. What are the estimated average costs for the first 500 golf carts?

a. Give answer as "average cost per golf cart"

3. What are the costs to produce the 500th golf cart?

a. Give answer in "\$ for 500th golf cart"

Concept Map

The concept map is created by the following method and sequence as described in the Table I.

Calculate the learning curve %

a) % calculation of unit 2 divided by unit 1

b) % calculation of unit 4 divided by unit 2

c) % calculation of unit 8 divided by unit 4

d) Etc., now average the above calculations and divide by the number of calculations.

Calculate the average cost of x number of units

a) Use cumulative values table to obtain factor (learning curve % and # units that are of interest) = fc

b) (unit #1 cost) * fc

c) Divide the "b" answer by the # of units that you are interested in for the average/unit.

Calculate the cost to produce any particular unit

Using "unit improvement table" and the "% learning curve": (unit #1 cost) x (table value for that unit).

Methodology Analysis

1. Averages were calculated (number of students in each group divided by their score).
2. Statistical calculations of significant differences were calculated using: <http://www.statpac.com/statistics-calculator/means.htm> and null hypothesis testing of paired differences.
3. Note: problem #1 (forecasting) was dropped from the study due to error in reporting results. Comparisons were made for the other nine problems.
4. The null hypothesis (H0) to reject is: There is no difference in test scores if the problem is presented as a simple word problem or a in the form of a concept map.

The alternative hypothesis, H1, is there is a difference in test scores if the problem is presented as a simple word problem or a in the form of a concept map.

The statistic will be developed using independent group's t-test between means using Stat Pac software.

A p-value of .05 or less rejects the null hypothesis "at the 5% level" that is, the statistical assumptions used imply that only 5% of the time would the supposed statistical process produce a finding this extreme if the null hypothesis were true. The actual p-value is .025 since it is a two tailed bell shaped distribution. Reject if t-value is > 2.048 .

RESULTS

Results of the t-test are shown in Table II

Table II t-test

	Problem 2		Problem 3				Problem 4		Problem 5		Problem 6		Problem 7		Problem 8		Problem 9		Problem 10	
	Reg	conc	reg	con	reg	con	reg	con	reg	con	reg	conc	reg	con	reg	conc	reg	con	reg	conc
1	1.33	2.00	2.00	1.33	2.00	2.00	2.00	2.00	2.00	1.00	2.00	0.00	0.50	1.50	2.00	2.00	0.00	2.00	2.00	2.00
2	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	0.50	2.00	2.00	2.00	0.00	2.00	2.00	2.00
3	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	1.50	2.00	2.00			2.00	1.00	2.00
4	0.67	0.67	2.00	1.33	2.00	2.00	2.00	1.00	1.00	2.00	2.00	0.00	0.50	0.00			1.00	1.00	0.40	1.60
5	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	2.00	2.00	2.00	2.00	1.50	2.00	2.00	2.00	2.00	2.00	2.00
6	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00
7	2.00	2.00	2.00	2.00	0.00	2.00	1.00	0.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
8	1.33	2.00	2.00	2.00	2.00	2.00	2.00	1.00	0.00	2.00	2.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00
9	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	1.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
10	1.33	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
11	2.00	2.00	2.00	0.66	0.66	2.00	2.00	1.00	2.00	2.00	2.00	1.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
12	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	2.00	2.00	1.50	0.00	0.00	2.00	2.00	2.00	1.00	2.00	2.00
13	0.67	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	2.00	2.00	1.00	1.50	2.00	2.00	2.00	2.00	2.00	2.00	1.60
14	2.00	1.33	1.33	2.00	2.00	2.00	2.00	1.00	1.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00
15	2.00	2.00	1.33	2.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	1.50	2.00	2.00	2.00	1.00	2.00	2.00	2.00
		1.33	2.00				2.00	1.47				2.00	2.00			2.00	2.00			2.00
16	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	2.00	2.00	0.00	1.00	0.00	2.00	1.00	1.00	2.00	2.00	2.00
17	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	1.20
18		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	1.00	0.00	0.00	0.00	2.00	1.00	2.00	1.20
19	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00			2.00	2.00	2.00	0.50	2.00	2.00	2.00	1.00	2.00	2.00
20	0.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00	1.50	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
21	2.00	1.33	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00
22	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00		2.00	2.00	2.00	1.00	1.00	1.60	2.00
23	2.00	1.33	2.00			2.00	0.00	2.00	2.00	2.00	2.00	1.00	0.50	2.00	2.00	2.00	1.00	1.00	1.60	2.00
24	1.33	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00
25	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	2.00	2.00	1.00	2.00	2.00	1.60
26	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
27	2.00	2.00	2.00	2.00	2.00	2.00	1.00	0.00	2.00	2.00	2.00	1.00	1.00	2.00	2.00	2.00	2.00	2.00	1.60	1.20
28	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	2.00
29	2.00	2.00	1.33	2.00	1.00	2.00	2.00	0.00	2.00	2.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	2.00	2.00	2.00
			1.33			2.00	1.00		2.00							2.00	1.00			1.00
average	1.74	1.87	1.91	1.90	1.85	2.00	1.47	1.21	2.00	1.93	1.31	1.30	1.66	1.79	1.55	1.52	1.89	1.90		
std dev	0.52385	0.323	0.228	0.3	0.48	0	0.562	0.69	0	0.37	0.64	0.698	0.77	0.62	0.506	0.574	0.32	0.252		
ss	28	30	30	28	28	30	30	28	29	30	30	28	29	28	29	28	30	29	29	30
t:		1.146		0.14	1.64		1.58	0.98		0.057		0.701		0.213	0.134					
df		56		56	56		56	57		56		55		57						
prob(2tail)		0.257		0.89	0.11		0.12	0.33		0.955		0.486		0.832	0.894					

Based on the calculated t values, none of the nine problems could reject the null hypothesis (H0) at a 95% confidence level, thus there is no difference in test scores if the problem is presented as a simple word problem or a in the form of a concept map. Since the correlation does not support the hypothesis, the results must be in the context of this specific problem genre. The discussion expands on the potential idiosyncrasies of this study. Simple graphing indicates the similarity and cross-over of data which supports the conclusion.

GRAPH 1
Problem Types

Problem #	Problem type
1	Forecast
2	line balancing
3	learning curve
4	logistics
5	capability index
6	inventory turns
7	ordering
8	kanban
9	critical path
10	waiting line

DISCUSSION

Anecdotally, augmenting a problem definition with a “visual step-through” or concept map would assist the problem-solver. This limited study has not demonstrated the CPM advantage.

Possible conditions affecting the results are: (1) the problem set was too simple to demonstrate advantages of CPM versus “Regular Word Problems”; (2) the student introduction to the problems was too thorough, i.e., prior to assigning the problem(s), a very similar problem was demonstrated thus clarifying the route to the problem solution.

CONCLUSION

Based on this limited study, problem solving via concept mapping of operations management problems (PCM) has no advantage over a solution via a normal word problem.

Expanding on the (1) discussion point, it is speculated by the authors that as the complexity of problem increases, the benefit of concept mapping increases. This is based on the belief that the mind has a limited ability to associate a great number of variables and visual connections are of value. Additional studies of the CPM approach are warranted if the above conditions, noted in the discussion, are avoided.

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Using a Consumer Matrix Model to Determine the Voice of Student Bodies

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ABSTRACT

This paper provides an introduction to a "voice of the student" methodology as it is applied to higher education students' needs and wants. The methodology is a modification that simplifies the normal, commercial QFD model. Their "voice" is contrasted against the available resources in the same way we would determine the voice of commercial customers. This model, however, provides a simpler approach. Current literature on education devotes many views on various approaches to enhance student learning (reinforcement techniques, visual approaches, assessment techniques, visual aids such as concept mapping, etc). In Quality Management and Marketing courses there have been elaborate models used to determine the commercial customers' "voice." One such matrix is the Quality Function Deployment, also known as the House of Quality Matrix or the Voice of the Customer. Ironically, as educators, we have not given sufficient attention to our students' wants and needs using the same models. This paper provides only the simplified model and not an actual case study. The model does, however, utilize actual data concerning student needs and wants data collected in a quality management class and then superimposed that information on the model.

Keywords: QFD, House of Quality, Voice of the Customer

INTRODUCTION

A popular approach used in industry to determine the wants and needs of the customer is the Quality Function Deployment (QFD), or the House of Quality (HOQ) matrix. It is a well-established method used to determine the Voice of the Customer (VOC) by developing relationships between what a customer wants and how a company plans to meet customer satisfaction. The objective of this paper is to provide a mechanism for the conversion of this established technique into a simpler approach for the determination of the higher education students' wants and needs as the Voice of the Student Customer (VOSC). Voice of the Student Customer and Quality Function Deployment used in literature.

The literature is rich in commercial QFD. Five elemental aspects will be reviewed to set the groundwork for conversion to the student QFD of VOSC:

1. A basic review of the nature of the house of quality (HOQ/VOC) mechanism.
2. Joseph Juran's Trilogy concept which enlightens us on the customers' needs and wants.
3. The psychological aspects related to customer wants and needs defined by Henry Murray.
4. The psychological aspects related to student wants and needs.
5. The influence of online student education in determining the unique wants and needs of online learners.

A basic review of the nature of the House of Quality (HOQ/VOC) mechanism

Much literature exists on the House of Quality mechanisms for commercial enterprises. This paper will not repeat that work, but it will model a simplified House of Quality approach that allows us to transition to the wants and needs of higher education students. We can borrow the QFD Functions for the student version without losing the basic meaning of the Quality Function Deployment (QFD). The following is a basic description of the existing business model for the "Voice of the Customer" (VOC) or "House of Quality" (HOQ).

The House of Quality is the systematic translation of the "voice of the customer" that determines the actions needed by the supplier to meet the customers' desires. It is based on a matrix comparing what the customer wants to how the supplier plans to provide it. This basic matrix is expanded to present additional insight of the provider regarding the needs and wants (VOC) and identifies the process parameters that meet the customer requirements. There are many varieties of HOQ, and many variations of the charts used. HOQ must start with an understanding of the customers' needs and wants. These become one axis in the matrix against an opposing axis representing the suppliers' degree of capability to provide the needed service. For example, Figure 1 is a hypothetical matrix for producing simpler selected areas. The available process (technology) can also be a set of parameters to meet a product requirement. An arbitrary set of symbols relates the needs to the available processes. Figure 1 (an essay example) provides degrees of filled circles representing the strength of relationship between the Customers' Needs and the Subjects: the filled circle a stronger relationship, the open circle a weaker relationship, and the "x" an adverse relationship (other sets of symbols can be used).¹

FIGURE 1. QFD Matrix

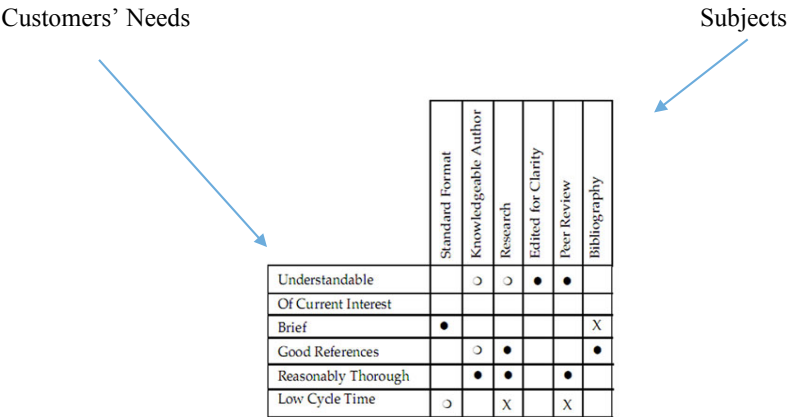


Figure1

Several observations may be made from Figure 1: The symbols provide an indication of importance. Without further analysis it would appear that "Research," which impacts more of the "Customers' Needs" than any of the other "Subjects," is the most important factor.

The "Customers' Needs" are rather vague. Some are subjective, such as "Good References" and cannot be quantified or are simple enough that they do not need to be. Those that can be quantified, however, should be. In Figure 1, "Understandable" could be further defined with a clarity index, "Brief" can be defined by a page limit, and "Cycle Time" by a specified time period. These, in turn, can be used to guide the editor, define the standard format, and establish time limits for peer review. The more that "Customers' Needs" can be quantified, the easier it will be to meet these goals and make them clearer to everyone reading the matrix.

None of the "Subjects" immediately address the "Customers' Needs". The supplier must find a way to address these needs, perhaps by establishing a means for customer feedback (which becomes a new "Subject"). The understanding of the customers' wants that a House of Quality may provide may be invaluable all on its own. However, there are several ways in which the matrix can be expanded to make it potentially more useful. Some of these are illustrated by Figure 2.

FIGURE 2: Expanded QFD Matrix

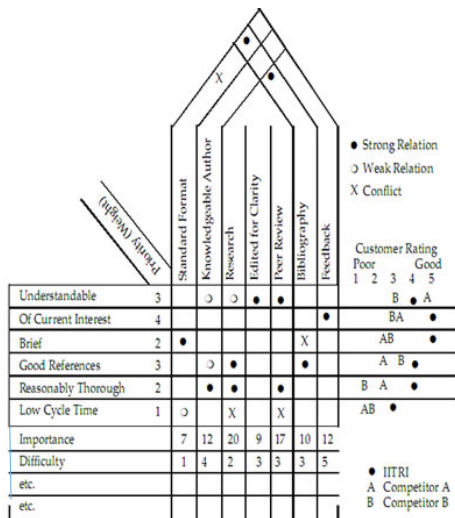


Figure 2

Added features of Figure 2 include a "Priority (Weight)," "Customer Rating," "Importance," and "Difficulty" comparison, and interrelationships among the different Subjects (the "roof" of the HOQ).

The relative importance of each of the "Customers' Needs" is quantified in a new column labeled "Priority (Weight)". This can be done by simply listing them in order of customer priority. It may be more helpful to assign each item a relative weight, based on a customer survey.

The relative importance of each "Subject" is established by weighting each symbol and summing down the columns. For example, a filled circle is worth 3 points, an open circle worth 1 point, and an x worth 2 points. Using these weights, research would be worth 9 points, and the standard format worth 4. In case of conflict, the research would be given priority. This procedure is further developed in Figure 2 by multiplying each symbol's weight by the weight assigned to the "Customers' Needs" in the row the symbol appears, thus accounting for the importance of the need, which is affected. Using the priority weights, research in Figure 2 has an importance rating of 20.

Customer perceptions of the degree to which the supplier and the supplier's competitors are meeting each need are shown in the right column as well, revealing sales points (where the supplier has an advantage over his competitors) and areas needing improvement.

Quantitative goals for each Subject such as measured achievements

by the supplier and its competition, estimates of difficulty, and other data of interest can be added below the basic matrix. These are more pertinent when the Subjects are parameters, rather than processes.

A correlation matrix (representing the "roof" of the House of Quality) shows the impact to the added matrix and how each subject relates to one another. This displays which supplier processes or product parameters reinforce others and which conflict, requiring trade-off. In Figure 2, the matrix recognizes that a standard format may preclude some ways of improving clarity.

In summary, the process of using a matrix approach to reach a conclusion is as follows:

1. Determine the customers' needs via interviews, surveys, focus groups, etc.
2. Weigh their needs
3. Compare perceptions of customers' wants to the competitors' offerings
4. Determine how your technology meets the customers' needs. Establish relationships from weak to strong
5. Summarize the weighted scores
6. Correlate the interrelationships between #1 and #4 in the "roof" of the matrix.

As stated before, the main purpose for the House of Quality is to provide the supplier with a better understanding of their customer's wants and needs to improve customer relations. Psychology plays a large factor in the obtaining of information needed for a House of Quality matrix, and there are many different approaches out there to help suppliers acquire this information.

Joseph Juran's Trilogy concept discovering the customer approach

We would be remiss in not introducing Juran's thinking in determining the methodology of discovering a consumer's thought process in expressing wants and needs. ² Joseph Juran, a noted quality discipline guru, has studied the psychology of how consumers express their wants and needs. Samplings of his findings are:

- The activities required to identify customer needs are: collect data, analyze, translate jargon, and create units of measuring satisfaction.
- Two design functions must go together: what the product will do/how it will function and how the customer will benefit from using the product.
- Human wants and needs are very complex and ever changing; you cannot make everyone happy, so you must decide what is most important, there is an art in interpreting what people want.
- Establishing units of measure and being specific with needs and abstractions.

- Grouping together of related customer needs.
- Advancement in technology with growing customer expectations puts pressure on cost and quality.
- Cultural patterns are important to customer needs as well; habits, preservation of status, etc.; customers will word it differently.
- Customers will not always know what they need; thoughts can be incomplete or if a product has not been invented yet, they won't know they need/want it until it is on the market.
- Customer suggestions may be subjective and unclear due to lack of communication skills.
- Customers' basic requirement is to "hear and be heard."
- Biggest challenge is linking the ability to meet customer needs with the customer's behavior.

Psychological aspects related to customer wants and needs per Henry Murray

Further expanding on Juran's thinking of psychological needs and wants are seen in psychological and physiological needs of human beings as part of Henry Murray's theories are expressed in six groups of needs:³

- 1.Acquisition: To gain possessions and property. To grasp, snatch, or steal things. To bargain or gamble. To work for money or for goods.
- 2.Conservancy: To collect, repair, clean, and preserve things. To protect against damage.
- 3.Order: To arrange, organize, put away objects. To be tidy and clean. To be scrupulously precise.
- 4.Retention: To retain possession of things. To refuse to give or lend. To hoard. To be frugal, economical, and miserly.
- 5.Construction: To organize and build
- 6.Superiority: This is divided into two different categories; Achievement and Recognition
 - i.Achievement: To overcome obstacles, to exercise power, to strive to do something difficult as well and as quickly as possible
 - ii. Recognition: To excite praise and commendation. To demand respect. To boast and exhibit one's accomplishments. To seek distinction social prestige, honors or high office.

Psychological aspects related to student wants and needs

It is possible that educators have come to view students as customers from the influence of the Malcolm Baldrige Award system in education. Viewing students as customers in the school systems is changing how students feel about school. ⁴ Government demand, rising prices, and stress on attending college have created more expectations in educating students and left less time for student interaction. With lack of time for a social life, students are finding less motivation to do their work, causing “disengagement” among school activities, lower scores, and more dropouts. The strong use of technology in classrooms has also contributed to the increase in expectations. In dealing with raising student motivation, there are several factors being looked at: Hygiene factors will affect the student’s comfort level on their quality of work space, motivation factors will have an effect on the student’s desire to be there, clarity in the work expected and availability of the information needed, and balance between extracurricular activities and classes. Some steps that could be taken include handling the students’ needs better: focusing more on time management skills and going over the facilities and resources available to them if they need help.

Some of the psychology of needs and wants may be seen in generational differences. ⁵ The following summary of the characteristics that lead to student desires explains important age diversity in education.

FIGURE 3-Generation Diversity

Generation	Born	Percent of Workforce	Characteristics	Learning Style
Silent/ Traditionalists	1925 to 1945	8%	loyal, patriotic, respect authority, personal sacrifice, civic pride, frugal	Teacher Centered lessons, require positive reinforcement
Baby Boomers	1946 to 1964	44%	want financial and material gains, competitive, like challenges	Like competition, like both traditional and active learning
Generation X	1965 to early 1980s	33%	independent and skeptical, technical skills, amenable to change, entrepreneurial	Prefer active learning and work alone or in small groups
Millennial/ Generation Y	1980's to early 2000s	15%	ethnically diverse, skeptical of authority, use technology, focused on achievement	Social and accustomed, open to new concepts and on-line education
Generation Z	early 2000s to present	0%	economic uncertainty, digital communicators, students	Want activities linked to goals, need frequent feedback, need positive feedback rather than constructive criticism. Seek instant gratification

Figure 3

The expanding pedagogy of online instruction raises a unique challenge to the model. Determining online student needs becomes a challenge due to the mix of location, age, educational levels, etc. The New Republic

has published data (see below) on 35,000 students exhibiting the diversity of students. The diversity complicates a one style solution to meet the needs of the different students. ⁶

FIGURE 4 Online Student Statistics INSERT

Students (All enrollment types)	%
USA	34.32
India	5.76
Brazil	4.07
Spain	3.60
Great Britain	3.57
Canada	3.50
Russia	3.25
Other Countries	41.93
Subtotal in listed countries:	100.00
Miscellaneous Categories	
% USA students in courses retired	14.00
% USA students in courses w/ college degrees	86.00
Subtotal of USA Students:	100.00
Types of studies	
Business, Economics	42.00
Science, Math	28.00
Arts, Humanities	27.00
Public Health	18.00
Misc	3.00
Subtotal of USA Students in above studies:	100.00

Figure 4

Creating a Student Voice of the Customer Model

The model HOQ is created from actual survey data (see Appendix 1 for full survey) used to find the wants and needs of current Quality Management students at the University of Wisconsin-Stout. ⁷ Two university quality management classes (45 students), taught by the author, were given a survey in the data collection. Data were developed from survey and focus group information. The information was categorized by the most significant student concerns. The weights, based on the students' percentage of importance of each question (noted in the 'Sorted by Preference' section below), were determined by investigating the percentage of students that answered the questions in the same way.

RESULTS

A summary of the findings (full findings in the appendix) were:

Strong Preference

1. 95.5% for test problems with in-class preparation.
2. 63.6% for instructors who provide relevant stories as part of the lecture.
3. 81.8% for electronically graded exams with instant feedback.
4. 84.1% for 60 minute class periods as ideal.
5. 52.3% for a mixture of true false and multiple choice questions on tests
6. 36.4% for the instructor to give broad comprehensive overview of readings.

Moderate Preference

1. 61.4% occasional Power Point slides of difficult concepts (charts and graphs).
2. 65.9% professor should spend about 75% of time in pure lecture
3. 61.4% written participation to allow adequate credit
4. 56.8% use of current text versus outside readings

Minor or not of concern

1. 40.9% thirty minutes of text reading prior to class.
2. 61.4% instructor relates contemporary news relevant to the subject.
3. 40.9% open-ended word limit on essays
4. 47.7% dislike a professor's disconnected thinking in lectures
5. 77.3% two major concepts per lecture
6. 72.70% are distracted by non-essential talking

Of the sixteen areas discussed, six were considered very important (strength of <1.5 index); five were of moderate importance ($1.51-1.75$ index); and six were not considered important (>1.76 index).

Importance Chart

Develop an Importance Chart (Pseudo-Pareto chart) of most important student surveyed wants and needs:

FIGURE 5 Importance Analyses

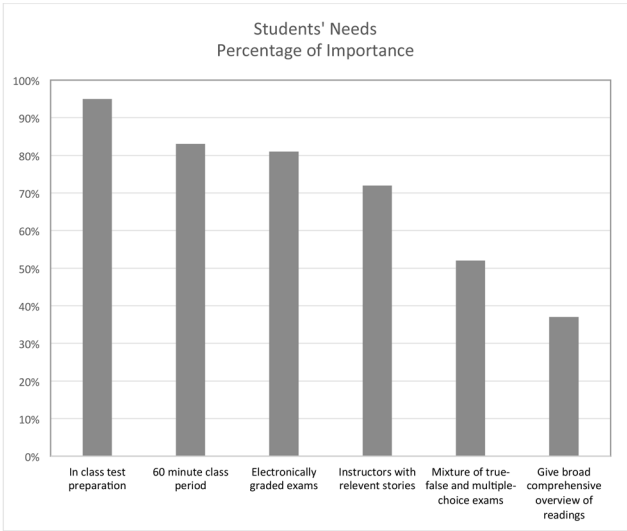
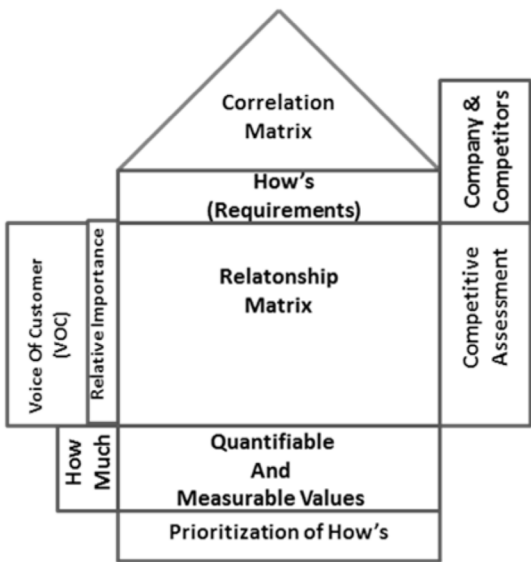


Figure 5

A. Prototype House of Quality Model
The basic structure is as follows:

FIGURE 6 Basic House of Quality Structure INSERT



For the Student HOQ, we can disregard the "competitive evaluation"

since we are focusing on one institution's desire to satisfy its students. This option could be added later to benchmark or even to profile a face-to-face vs. an online course. In addition, the use of symbols can be eliminated in favor of numeric values—the larger the value, the greater the ability to satisfy the needs. As important are the lower values as they indicate an area to be developed or a disconnection of needs to satisfaction. Thus, the matrix, although in the spirit of the HOQ, is greatly simplified to satisfy the student needs/satisfaction relationship.

The resulting matrix is as follows:

B. Actual House of Quality Example Based on Survey Data

FIGURE 7 Modified HOQ Matrix INSERT

Technical Requirements	Ability of School to schedule	Electronic system like D2L or Blackboard	Instructors with Industrial experience	Department Guid lines on tests	Instructors' Approach	Instructors' Approach on concepts to present	
Voice of the student							Student Priority
Test problems with in-class preparation.					57		9.6
60 minute class periods as ideal.	42						8.4
Electronically graded exams with instant feedback.		57					8.2
Instructors who provide relevant stories as part of the lecture.			32				6.4
Mixture of true false and multiple choice questions on tests				36			5.2
Instructor to give broad comprehensive overview of readings.						22	3.6
Technical Requirement priorities	5	7	5	7	6	6	
comment:	all values were made up for demonstration purposes						
Value:	>50	H	Very achievable				
	30-50	M	moderately achievable				
	<30	L	difficult to achieve				

Figure 7

CONCLUSION

The HOQ has many variations in structure. The above model is simplified by its ability to read the magnitude of the numbers. A high magnitude is very achievable and can meet the students' needs. A moderate or low value is where focus for improvement is required. In many cases in education, a focus is required on employing the correct professors to meet the students' needs.

It is necessary to analyze the demographics of the generations and the differences between face-to-face and online students. In reality, there is no pure population and weighted analysis is required to satisfy the majority or to design different courses for the student segments.

The ultimate goal of the model was to note the higher issues of student importance and simplify the available commercialized QFD House of Quality. It has been accomplished by first, creating a Pareto Chart for the students' concerns and then applying the reduced facets (unnecessary elements in education) of the House of quality

Summary of Customer (Student) Needs and Wants

The following data determined the customers' needs via interviews, surveys, focus groups, etc.

The results below provide this basic information: Only strong and moderate preferences are listed

Strong Preference

- 95.5% for: test problems with in-class preparation.
- 63.6% for: instructors who provide relevant stories as part of the lecture.
- 81.8% for: electronically graded exams with instant feedback.
- 84.1% for: 60 minute class periods as ideal.
- 52.3% for: a mixture of true false and multiple-choice questions on tests
- 36.4% for: the instructor to give broad comprehensive overview of readings.

Moderate Preference

- 61.4%: occasional Power Point slides of difficult concepts (charts and graphs).
- 65.9%: professor should spend about 75% of time in pure lecture
- 61.4%: written participation to allow adequate credit
- 56.8%: use of current text versus outside readings

APPENDIX I

Actual Survey Questions

I. Lecture Approach

A. What is your desire for the amount of time that the instructor devotes to the lecture portion of the class period:

B. What is your desire for the lecture content portion:

C. Use of Power Point:

D. Instructor's personal approach (assuming there is always a variety of personalities) and assuming a pleasant demeanor:

II. Exams

A. Exams- verbal: which type do you prefer (if more than one note 1,2,3.. for preferences):

B. Exams-methodology

C. Essays

III. Problems to be graded—some math type problems may arise, what is your opinion:

A. Type of Problem

IV. Participation

A. Method of participation desired

V. Readings

A. Desired required readings (this is dependent on material, but give a general answer):

B. Sources of readings desired

VI. Classroom Protocol

A. What bothers you the most from you classmates during class?

B. What bothers you the most from your instructor during class?

C. Other than strict subject focus, is there a desire to

VII. Grade Composition

A. What reflects your learning outcome via a grade

VIII. What is an ideal class period

IX. How many difficult concepts can be discussed in a 50-60 minute class period?

APPENDIX II

Actual Survey Answers

Key to weighting

1: highest concern

2: moderate concern

3: least concern

Weight Given: 1.27

Problems to be graded—some math type problems may arise, what is your opinion

Weight: 1.32

Preferred instructor's personal approach (assuming there is always a variety of personalities) and assuming a pleasant demeanor?

Answer: Sense of humor to lower classroom stress.

Weight: 1.32

Preferred exam methodology

Weight: 1.35

Answer: Electronic with instant grading

Weight: 1.39

Grade Composition: What reflects your learning outcome via a grade: indicate the weight of the elements that you feel are appropriate

Weight: 1.41

What is an ideal class period?

Answer: 60 minutes

Weight: 1.55

Exams- verbal: which type do you prefer (if more than one notes 1, 2, and 3... for preferences)?

Weight: 1.56

What is your desire for the lecture content portion?

Answer: Give broad comprehensive review of the chapter's readings

Weight: 1.68

Appropriate use of Power Point?

Answer: I like it for specific issues, i.e., graphs, pictures, etc.

Weight: 1.7

What is your desire for the amount of time that the instructor devotes to the lecture portion of the class period?

Answer: 75%

Weight: 1.75

Method of participation desired:

Answer: Individual-written comments to instructor

Weight: 1.82

Sources of readings desired:

Answer: Course textbook

Weight: 1.84

Desired required readings (this is dependent on material, but give a general answer):

Answer: 0-30 minutes prior to class

Weight: 1.86

Other than strict subject focus, is there a desire to?

Answer: Briefly, hear about related contemporary issues (breaking news)

Weight: 1.89

Essay style preference?

Answer: Open-ended for number of words

Weight: 1.91

What bothers you the most from your instructor during class? (Rank if more than one, with #1 being the most annoying)

Answer: Disconnected thinking (jumps around and does not connect concepts)

Weight: 2.02

How many difficult concepts can be discussed in a 50-60 minute class period?

Weight: 2.02

What bothers you the most from your classmates during class? (Rank if more than one, with #1 being the most annoying)

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A Content Analysis of the Journal of Student Research: Exploring the Research Culture of a University

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ABSTRACT

The purpose of this project was to gain better understanding of the research culture of the university by conducting a content analysis of the articles in the university student journal. The University of Wisconsin-Stout Journal of Student Research had its inception twelve years ago. An analysis of its contents has yet to be conducted. In order to gain greater understanding of the research culture at this university, the faculty-researcher and student-researchers co-conducted a content analysis of the university-based journal. Reported are findings from the following areas: total number of articles, authoring practices, advising patterns, count by department, attention to ethics, identification of article type, and content areas within articles. Implications for the journal, as well as student, faculty advisors/authors, and the larger university community are discussed.

Keywords: advising, authoring practices, collaborative research, college students, content analysis, research ethics, research integrity, student research, university journal, university publication, university research, university students

INTRODUCTION

During the 2013-2014 academic year, the University of Wisconsin-Stout (UW-Stout) began the process of identifying itself as an "applied research institute" (ARI) or "emerging research institute" (ERI; Bomar et al., 2014). Simultaneously, the faculty-researcher (M.L.C.B.) was awarded a Center for Applied Ethics Scholar position and related grant, became a member of the ERI university committee, and began teaching a graduate level research methods course. The faculty-researcher became curious about the research culture of the university as a whole, particularly as it was more formally defining its research identity. The faculty-researcher believed it was imperative to examine the research practices of the institution as it makes this transition (Blumer, Buchanan, & Klucarich, 2014a). One way to explore the research culture of the institution was via a content analysis of the student journal.

Background and Literature Review

With the overarching aim of learning more about the research culture at this particular institution, the faculty-researcher co-conducted a content analysis of the journal of the university with a team of student-researchers. The Journal of Student Research (JSR) at this institution was born out of an idea by the administration to have a "faculty journal of research" (Foxwell, 2013). When faculty learned of this idea, the overwhelming response was that such a journal would not be beneficial to faculty publication records due to the need for faculty to publish outside of the university in peer-reviewed scholarly journals (Foxwell, 2013). The faculty did agree that there was value in having a university-based scholarly journal, but they believed a "student journal of research" would be more appropriate (Foxwell, 2013). The response by the faculty over a decade ago appears consistent with the current research culture of the UW-Stout (Blumer et al., 2014a). Indeed, results from a recent mixed-data survey study demonstrate that when discussing research productivity, while the majority of participants had not participated in research in the role of researcher ($n = 623$, 62%), of those who had, most reported that their experiences had been conducted collaboratively ($n = 80$, 62%) with the most common collaborators being students ($n = 52$, 65%) (Blumer et al., 2014a). Thus, there is a clear valuing of student involvement in research at this university.

In the early 2000s, shortly after this larger university dialogue, the university Research Services Director, with the help of a quarter-time graduate assistant, was assigned the project of co-creating, and co-supervising the production of a student research journal to be completely produced by students (Foxwell, 2013). The team was given a year from inception in 2001 to first printing in 2002, and despite this short time frame, the team was successful in producing a student-focused research journal (Foxwell, 2013). In 2005, the JSR was acknowledged by the University of Wisconsin-System (UW-System) Board of Regents for facilitating such an impressive source of applied research carried out by students, and for the leadership provided by the UW-Stout in developing the journal (Foxwell, 2013).

Since the inception of the JSR, approximately 173 articles have been published between the years of 2002 and 2013, yet a content analysis has not been conducted. Moreover, a thorough review of the larger body of peer-reviewed scholarly literature to date yielded no like analyses—those aimed at analyzing the content of a student or a university-based journal. Again, exploring the content of a student journal is one way of telling us more about the research culture of an institution over time. To this end, analyzing publications in an academic journal represents one way of demonstrating

research productivity and performance—or the extent to which researchers are involved in the academic community (Chung & Petrick, 2011; Green & Bauer, 1995). Thus, an analysis of trends in academic publications is essential in order to assess an institutional community's previous, current, and potential commitment to research (Chung & Petrick, 2011).

Although, there is no known scholarly research on this university and/or on student journals in general with regard to exploring things like research productivity or performance, scant research does exist on the research productivity of graduate students. For instance, Chung and Petrick (2011) examined the research productivity of doctoral students within the field of tourism and hospitality. Using an alternate regression model, the researchers identified significant factors influencing the students' scholarly publications within major journals of the field. The researchers found that two variables significantly influenced doctoral student publications —productivity of one's co-authors and the model of involvement in research programming by the institution.

Purpose

The purpose of this study was to conduct a content analysis of the articles in a university-based student journal in order to better understand the research culture of the university. All ten of the master's level marriage and family therapy (MFT) graduate students enrolled in the spring 2014 MFT 765: Research in Psychotherapy course were included as members of a research team on this content analysis. To identify the content contained within the JSR, the team completed the analysis on every volume—from the first year to the last (at the time of the content analysis)—2001 to 2013. In the analysis, the team focused on the following areas: methodology, departments/programs, topic areas, authorship, attention to ethics, focus on diversity, and potential clinical implications and applications .

METHODS

Before beginning this content analysis, all of the members of the research team successfully completed the university human subjects training. In addition, institutional review board approval in the form of an exemption was obtained in January of 2014.

Categorical Analysis Process Procedure

The process for this content analysis was guided by procedures in previously published content analyses lead by the faculty-researcher (i.e., Blumer, Green, Knowles, & Williams, 2012; Blumer, Hertlein, Smith, & Allen,

2014) that focused on content areas within the family therapy field, which is the faculty member's primary discipline. In the current content analysis, the team began by dividing up the twelve volumes of the JSR. Student-researchers self-selected one journal to analyze from volumes 1-9, and 11. These ten volumes were divided up in this manner as they were the smallest in terms of total pages. The remaining two volumes, 10 and 12, were divided by number of pages with most student-researchers having 15 pages per volume to analyze. In addition, the faculty-researcher had roughly 175 pages in one volume to analyze, and 15 pages in the other. Upon the division of all of the content, the researchers had relatively the same number of pages, which was between 150-200.

After the dividing of the journal content, team members began reading the articles independently. While reading, the team had general instructions to be thinking about what the content reveals with regard to: 1) the research culture of the university and about research with and by students, 2) a range of topics and how they apply to their clinical work with people across a variety of backgrounds, and 3) how to conduct a content analysis and engage in research in a collaborative manner. Reported in this manuscript are the findings related to what the JSR content might reveal about the university research culture. Next, the faculty-researcher organized the 173 articles into a summary table by volume of the journal, year of publication, number of articles within the publication, and author classification (see Table 1.) regarding the fit of coding content into certain categories occurred. During this conversation, the research team discussed the need for greater clarity in the definition of certain categories. One area that needed greater clarity was determining whether the content fit into a definition of research, and relatedly, what kind of research method said content was considered. The research team shared that it was difficult to determine if some of the content of the journal was indeed research, because a definition of research was not evident within the journal itself nor in many of the articles. To this point, the faculty-researcher consulted with the Research Services Director, and the definition of the university as an ARI was agreed upon as the most apt definition to use for the sake of the analysis. In this context research is defined as "the original, uniquely human endeavors that contribute intellectually or creatively to a discipline."

Other questions that the team needed greater clarity around included, "What kind of attention do we mean that the researchers are paying to ethics? Is it overt attention (i.e., focus of or mentioned in study, institutional review board approval mentioned, etc.) or covert attention (i.e., intuit ethical attention based on information, but not mentioned)?" As a result of these

type of method while others did not, nor was it obvious via review of the content itself. Based on this dialogue, the team decided to code the following categories of research methods: quantitative, qualitative, mixed, literature review, and unspecified. The team agreed the “unspecified” categorical coding would be used at times when the method was not made explicit, nor was the method possible to intuit based on review of the content.

Compiling of the Content Analysis

After this discussion, the research team completed their categorical coding of their content, and the student-researchers submitted their content analyses. The faculty-researcher then began to compile the various content analyses into one comprehensive analysis. This compilation was shared with the team as a whole for peer review and fidelity checking. The research team reviewed the compilation and confirmed that it was representative of their individual content analyses, and the agreed upon categories. For further fidelity checking and peer reviewing categorical findings were then shared with members of the Center for Applied Ethics as a final trustworthiness check before dissemination to the larger university community, student journal, and dissemination outside of the university setting. After the completion of these final steps, the categories from the JSR were finalized and are presented below.

Findings

The primary topic area of each of the JSR articles is summarized in Table 2. The research team anticipated that content themes would emerge, be easily identifiable, and be shareable in a more meaningful and condensed manner. Instead, the team discovered much variability in the topic areas, and thus were unable to recognize patterns within the content itself by topic.

Yet, when the team examined the content of each of the articles by department and faculty adviser/author, clear patterns emerged. The pattern that emerged from this part of the analysis revealed that three departments have produced much more (i.e., more than 20 articles over the twelve year period) than others—namely the departments of Human Development and Family Studies, Art and Art History, and Engineering and Technology. To further assess representation, the team summarized the frequency in which faculty members advised students and their projects that were published in the JSR. The pattern that emerged mirrors the departments with the most publications. In other words, the most frequent advisors of students publications were from the three departments that produced the highest volume of student publications—namely S. M. Wolfgram., C. Lume, and C. K. Sand,

respectively.

In addition to these areas emerging as patterns revealing more about the research culture of the journal and relatedly, the university, patterns about the research methods were revealed. From this analysis, the following methods were used most to least frequently: quantitative ($n = 72$, 41.62 %), unspecified ($n = 58$, 33.53 %), literature review ($n = 21$, 12.14 %), mixed ($n = 11$, 6.36 %), and qualitative ($n = 6$, 3.47 %).

Lastly, by examining author attention to ethics across each of the articles per publication year, more patterns, with regard to the research culture, were uncovered. From this analysis, attention to ethics appears variable, yet with a slight increase over time. However, ethics is not being attended to in the majority of the articles ($n = 101$, 58.4%). In the instances in which ethics is being addressed, it is more commonly attended to in an overt or purposeful manner ($n = 58$, 33.53 %) than in a covert one ($n = 14$, 8.1%).

Discussions and Implimentations

Given that this was the first content analysis of its kind in this university setting, and likely across university settings, there are several findings warranting discussion. Additionally, there are related implications for students, faculty advisors/authors, the journal, and the larger university community. In general, findings from this content analysis do provide greater information with regard to the research culture of this university.

Variety of Topical Content Areas

In analyzing the content in the JSR in terms of the kinds of topics covered, the clearest theme that emerged was that there is a great range of topics upon which students conduct research. The team was particularly impressed with the depth and breadth of content within the journal, especially in the context of the research being primarily student generated. What made the reading of the research articles more interesting was that the content was so varied and interdisciplinary in nature. The team went on to share that this made for a more enriching learning experience than if the team had conducted a content analysis that focused upon a field-based journal. Rarely do students and scholars have time, need, or interest to read outside of their disciplines, thus this content analysis made for a unique scholarly opportunity.

What will aid scholars of the future in reading, citing, and perhaps replicating some of the projects within the JSR is that they will now be able to refer back to Table 2 to see exactly which topics are covered in which volume. This format may make the accessing of the content of the journal

queries, and the discussion around them, the team decided to indicate if there was attention to ethics, and if so, whether it was overt or covert attention.

Table 2

Year	Topic Areas
2002	• Customer service
	• Evaluation, No Child Left Behind Act, Family impact analysis
	• Program promotion, Eating fruits and vegetables
	• <i>M. capsulatus</i>, <i>M. trichosporium</i> methanotrophs, Peat bogs
	• Metal: X, Hazardous wastewater treatment, Gallium arsenide wafers
	• Administrative assistant competencies, Technical colleges
	• Closed pumping systems
	• Sexual harassment, Hospital industry
	• Chemical transportation, Terrorism
	• Calcium gluconate, Zephiran, Hydrofluoric acid treatment
	• Supercritical carbon dioxide, Solvents, Semi-conductor industry
	• Stirling engines
	• Organizational justice, Organizational citizenship behaviors
2003	• Audio prescription, Labeling system
	• Audio prescription, Labeling system Humor, Therapy, Counseling
	• Hypergeometric functions
	• Parental responsibility, Juvenile behavior
	• Mineral content, Canning quality
	• Texture screens, Photo printing
	• Enzyme kinetics
	• Student/faculty, Alcohol and other drugs, AODA
	• Gender, Premature termination, Therapy, Counseling
	• Oxygen consumption, Muscle respiration
2004	• Self-esteem, Gender, Memory, and Advertisement
	• High grade paper production, Pulp additives
	• Covenant marriage, Family impact analysis

	• Medical devices, Medical packaging, Sterilization, E-Beam technology
	• Safety syringe programs, Medical setting
	• Twin-injection molding system, Cost savings
	• Packaging color, Customer attraction
	• Child-resistant packaging, Senior-friendly medical products
	• Medical package testing, Integrity testing
	• Design exploration, Utility patents
	• Business marketing strategies, Rural Indian markets
	• Gender stereotypes, Contemporary culture
2005	• Nanocomposite technology materials
	• Team conflict, Workforce, and Conflict resolution, Work team
	• Packaging materials, Advertisement choices
	• Short-term memory, Auditory stimuli, Visual stimuli
	• University students, Home to college transition
	• Male odalisque
	• Ominous atmosphere
	• Aluminum bottles
	• Packaging, Over-the-counter market, OTC market
	• Schools, Obesity
	• China, Shipping
	• Instructional design, Complex learning
	• Recycling, Community improvement
2006	• Psychological responsibility, Generation Y, Millennial generation
	• Iris recognition
	• Molecular analysis, Grasshoppers, Prairie restoration
	• Functional foods, Blueberry muffin
	• Over-scheduled children, Childcare workers
	• Social justice, Creative work
	• Art structure, Creative work
	• Art exaggeration, Creative work

	• Behavior change, Transtheoretical
	• Gender differences, Caregiving, Male caregivers,
	• Maple syrup, Chemical properties, Physical properties
	• Peer interviewing, Business, Training
2007	• Child custody placement, Social work students
	• Morpholino oligonucleotides injection techniques, Embryo production, Brine shrimp survival, Functional genomics, Zebra fish
	• University students, Lexicography, Pop, Soda
	• Media, Gender stereotypes, Body image, Female college students
	• Eating disorders, Male college students
	• Japan, Efficiency, Recycling methods
	• Photographs, Domestic animals, Exotic animals, Stress levels
	• University students, Marriage, Graduation, • Post-graduation marriage
	• Creative work, Life and Death, Fate and Eternity
	• Creative work, Separation eternal
	• Creative work, Mugs, Trays
	• Creative work, Seascape
	• University students, Infidelity
	• Fingerprint identification systems, Edge detection, Feature extraction
	• Traditional college freshman, University students, High school counselors, College preparation
	• Measuring bacteria, Colony count, Environment
	• Ultraviolet/electron beam inks, Cost reduction, Performance, Efficiency
	• Alcohol and other drugs counselors, AODA, AODA counselors, Methamphetamine, Substance use, Children
	• University students, Lesbian, Gay, Bisexual, Transgender, LGBT
	• Female college students, Abuse, Abusive relationships, Abuse re-entry
	• Protecting wetlands, Managing wetlands, University
2008	• Gender stereotypes, Altruism

	• Knowledge management, Organizational culture, Organizational structure
	• Family support, Inmates, Incarceration
	• Virtualization, VMware, Performance testing
	• Childhood obesity, Nutrition, and Physical activity
	• Creative work, Bingo, Bargain shopper
	• Creative work, Migration
	• Creative work, Big boned, Mattress, Neighbor
	• Creative work, Furless, Weight
	• Discipline practices, Intergenerational transmission, Corporal punishment
	• Vocational evaluation, Assistive technology, Persons with disabilities
	• Divorce, University students, Marital status, Guardian relationships, Committed relationships
	• Community visioning, Community intervention, Change agent, Community collaboration
	• Heart disease, Lipid profile, Cholesterol, Cranberry seed oil
2009	• Caddis fly larvae, Visual system, Light response
	Gift giving, Mental stress
	• University student education, University student comfort, Lesbian, , Gay, Bisexual, Transgender, LGBT
	• Game-based learning
	• Natural inspiration, Art
	• Memory, Human psyche, Art
	• Double standards, Language usage, Language usage expectation
	• Containment, Protection, False protection
	• Parent communication styles, University students, Sexual attitudes
	• Technology skills, Online classes
	• Hiring discrimination, Employment discrimination, Tattoos, Piercings
	• E.coli, E. coli removal, Produce, Household agents
	• Adoptive parents, Children with disabilities
2010	• Infidelity, University students

	• Vacuum brazing technology, Silicon carbide
	• University students, Visible body modification, Employment
	• Sustainability, Biodegradable-based plastics, Petroleum-based plastics
	• Recidivism, Jail, Male inmates
	• Metal Joints, Metal brazing, Silicon nitride, Micro hardness
	• University students, Health insurance, Uninsured
	• Gender attitudes, Homosexuality, University students
	• International adoption, Adoptive parents, Assimilation
	• African-Americans, African-American culture, African-American jubilee
	• Green tea, Storage, Antioxidants
	• Parenting styles, University students, Personal agency
	• Ceramics, Stacker jar, Art
	• Painting, Bud vase, Art
	• Painting, Self-discovery, Art
	• Acrylic, Art
2011	• Infidelity, University students
	• Microphages, Gene expression, Conidial germination
	• Globalization, Globalization theory, Conflict resolution strategies, Conflict resolution
	• Pre-meal Beverage consumption, Beverage consumption Weight management, Weight management tool
	• Gender, University alcohol policy, University students
	• Socioeconomics, Dropout rates, School dropout
	• Incarceration, Incarcerated fathers, Fathers, Family involvement
	• Skin color, Ambiguous aggression
	• Art expression
	• Creative work, Core
	• Creative work, One and a thousand nights
	• Gender Differences. University students, Marriage, Marital attitudes, Marital beliefs
	• Accuracy, Comprehension, Fluency, Guided reading, Instruction, Running record
	• Parent peer support, Child mental health

	•Hmong women, Gender roles, Decision-making
	• Gender, Tanning, University students
	• Facebook, Hiring, Recruitment tools
	• Career development, Gender, University students
	• Male college students, Masculinity, Contemporary Masculinity, Media
2012	• Foster children, Foster mothers
	• Isamu Noguchi, Sculpture, Utopian Landscapes, Playgrounds, Gardens
	• African-American students, Social integration, Racial identity development, White institution, Student organizations
	• Adoption, Media, Welfare spending
	• On-site childcare, Childcare, University childcare, Parenting, Parental attitudes
	• Low income households, Low income, Private transportation, Quality of life
	• Gender differences, Cyber bullying, Symbolic interaction
	• Cover crop, Rye, Invasive plant species, Native ecosystems
	• Mixed media art
	• Contemporary art
	• Ceramic craft
	• Clay art, Sin
	• Bees, Bee guts, Colony collapse disorder
	• Immunology, Immune response, Macrophages
	• Loungewear, Nightwear, Consumer trends, Sleepwear
	• Lithography, Budget, Adhesives, Inexpensive material
	• Hedonic hunger, Hedonism, Hunger, Age, Gender
2013	• Soren Kierkegaard, Albert Camus, Spiritual truth, Leap of faith
	• Inonotus obliquus, Bioactive effects, Cultured human cells, Cancer therapy
	• Nanomaterials, Crystal structure
	• Human immunodeficiency virus, Acquired immune deficiency syndrome, HIV/AIDS, Early childhood education, Acceptance, Child study centers

	• Information technology, Communication technology, Elder adults
	• Cinematic observation, Film viewership, Film, Environmentalism
	• Native wet prairies, Invasive competitive plants
	• Transformation, Creative work
	• Creative work, Half-moon
	• Creative work, Memory
	• Creative work
	• Potassium chloride, Potassium-based emulsifying salts, Emulsification, Emulsifying salts, Sensory, Pasteurized processed cheese
	• Online content, Online trust, Online credibility

Categorical Analysis Coding Process

Table 1. *Information on Journal of Student Research Articles*

Volume	Year	Number of Articles	Author Classification
1	2002	13	6 undergraduate 8 graduate
2	2003	10	18 undergraduate 11 graduate
3	2004	12	12 undergraduate 1 graduate
4	2005	13	14 undergraduate 0 graduate
5	2006	12	12 undergraduate 5 graduate
6	2007	21	30 undergraduate 0 graduate
7	2008	14	12 undergraduate 6 graduate
8	2009	13	15 undergraduate 3 graduate
9	2010	16	25 undergraduate 0 graduate
10	2011	19	29 undergraduate 2 graduate
11	2012	17	20 undergraduate (15 senior, 5 junior) 1 graduate
12	2013	13	15 undergraduate (13 senior, 2 junior) 3 graduate

All of the 173 articles were reviewed through several coding and categorizing processes (as briefly described below).

Initial Categorical Coding

In order to explore the content of the articles, the team developed their own coding process and related categories. The first-order categorical coding was conducted by the faculty-researcher after having conducted a review of the literature around exploration of institutional research cultures. The first-order categories were presented to the student-researchers and included: volume of journal, year of publication, authorship, research method, department/program affiliation, topic or area of focus within the article, and attention to ethics.

Secondary Categorical Coding

With the categories to code in place, the research team began further reviewing and coding the articles within their respective journals. A dialogue regarding the fit of coding content into certain categories occurred. During this conversation, the research team discussed the need for greater clarity in the definition of certain categories. One area that needed greater clarity was determining whether the content fit into a definition of research, and relatedly, what kind of research method said content was considered. The research team shared that it was difficult to determine if some of the content of the journal was indeed research, because a definition of research was not evident within the journal itself nor in many of the articles. To this point, the faculty-researcher consulted with the Research Services Director, and the definition of the university as an ARI was agreed upon as the most apt definition to use for the sake of the analysis. In this context research is defined as "the original, uniquely human endeavors that contribute intellectually or creatively to a discipline."

Other questions that the team needed greater clarity around included, "What kind of attention do we mean that the researchers are paying to ethics? Is it overt attention (i.e., focus of or mentioned in study, institutional review board approval mentioned, etc.) or covert attention (i.e., intuit ethical attention based on information, but not mentioned)?" As a result of these queries, and the discussion around them, the team decided to indicate if there was attention to ethics, and if so, whether it was overt or covert attention.

Categorical Coding

A final conversation on the coding of categories took place. At this time the team discussed the need to further clarify the options when coding various forms of research methods. Some of the articles explicitly stated the

to date more readily accessible. In addition, despite the fact that there was great variety in the topics contained within the JSR, there were some topics that had greater representation than others. For instance, content related to: university students, alcohol and drugs, binary genders, sexual orientation minorities, adoption, technology, infidelity, and packaging, were some of the topic areas with greater representation. Thus, authors interested in submitting a piece focused in one of these content areas, upon submission, may benefit from articulating how their work is similar to and different from those works previously published in one of these areas.

Frequency of Publication by Department and Faculty Advisor

As was noted in previous literature, measuring publications in academic journals allows for assessment of a community's historical, present, and future commitment to research (Chung & Petrick, 2011). In considering the number of publications per year, this community has demonstrated a commitment to consistent publication, as the total count has never been fewer than 10 articles per volume. In more recent volumes, there have been as many as 19 articles per volume. In considering this general increase in articles, one could speculate that the commitment to research, and relatedly dissemination, has grown over time. When considering this finding in the context of publication by department, however, such a commitment to research and dissemination may not be occurring evenly across the university, as some departments are producing more than others.

There are any number of reasons for this discrepancy across departments. For instance, there may be limited resources to support research endeavors in some departments (e.g., those without graduate programs, graduate assistants, research courses, research equipment, well-defined research expectations, etc.), making it challenging for faculty to find the time to co-conduct and/or advise student research. If such research is not being conducted, it cannot be disseminated. Another possible reason why some departments may not be represented as frequently in the JSR could be that students and faculty are publishing, but doing so elsewhere. Findings from the mixed-data study of the university community as a whole lend support to this point (Blumer et al., 2014a). Indeed, Blumer and colleagues (2014a) found that while the bulk of respondents reported they had not participated in research in the role of researcher, of those who had their most frequent venue for dissemination was in peer-reviewed journals.

It may also be the case that research dissemination in the JSR is not occurring evenly because of differences in co-authoring and advising practices, as well as the model of involvement in research that is being employed

within departments. Returning to the literature, Chung and Petrick (2011) found that two variables influence student productivity—the productivity of one's co-authors and the model of involvement employed in research programming by the institution. In the context of the current analysis, a theme that seemed to influence productivity in students was the faculty advisor, who in some instances served as a co-author.

Some advisors were repeatedly able to motivate students to engage in and disseminate their research. Perhaps, it is the case that these particular faculty advisors may have a well-defined and described model of involvement in research programming that serves as a guide for their students, or they themselves have become a model in inspiring their students to engage in research. For instance, one of the faculty advisors, whose students frequently publish in the JSR, provides advisees with specific guidelines, directions, and expectations around their research projects, as well as remains collaborative in their involvement with the students in conducting their projects from start to finish. In addition, the advisor provides the students with a template, as well as published examples, to assist them in disseminating their projects for publication in the JSR and/or other academic venues.

As the findings from the mixed-data survey study of the larger university community reveal, although, the bulk of participants have not conducted research, more than half of them, including students, would like to do so ($n = 506$, 50.5%) (Blumer et al., 2014a). In addition, there are benefits for students who engage in research (Nagda, Gregerman, Jonides, Hipel, & Lerner, 1998; Prince, Felder, & Brent, 2007). For example, student retention is improved when undergraduate students collaborate with and are mentored by faculty on research (Nagda et al., 1998; Prince et al., 2007). Thus, an implication from the current content analysis seems to indicate that there may be benefits for those students who are publishing in the JSR and relatedly who are being advised by faculty mentors. As some faculty advisors appear to have more experience and related expertise, perhaps it would be beneficial for them to mentor or conduct a training for less seasoned faculty advisors on the "how-to's" of successfully guiding students through research and related dissemination processes.

Precision of Research Practices

Quantitative methods are the most frequent methodology utilized by authors in the JSR. This finding parallels reports that quantitative methods are most common across scholarly journals in general (Hunter & Leahey, 2008; Sullivan, 2001). This is most likely because quantitative investigation dates back to times when people first started counting and recording events. With the formalizing of the scientific method, rooted in the positivist frame-

work, quantitative research methods began to take shape in the way that we recognize such methodologies today (Sullivan, 2001).

That both qualitative and mixed methods were utilized less frequently than quantitative methods also parallels the frequency of these research methods disseminated outside of the university setting. Although, qualitative methods have been reported in scholarly literature going back to the 1970s, such methods have yet to be utilized as frequently as quantitative methods (Denzin & Lincoln, 2000). The use of mixed methods is even more recent in the scholarly literature—going back roughly 15 years (Tashakkori & Teddlie, 1998).

Contextually it makes sense that many of the publications in the JSR are in the form of literature reviews, given that a substantial number have historically come from disciplines outside of the sciences. It also makes sense that many of these literature review publications occurred prior to 2008 (3 of 21 or 14.3% in 2002, 1 of 21 or 4.8% in 2003, 0 of 21 or 0% in 2004, 8 of 21 or 38.1% in 2005, 3 of 21 or 14.3% in 2006, 4 of 21 or 19.1% in 2007), as in the years since this time the university has been in transition to a more formalized research identity. Indeed, there were only two literature review publications in the JSR post-2008—one in 2009, and another in 2010.

Finally, that the second most frequent type of research method appearing in the JSR cannot be clearly specified may speak to a need for greater clarity around how the journal and relatedly university itself defines and categorizes research, and to the need for researchers to make explicit their methods when disseminating (Gambrel & Butler, 2013). At present, the guidelines for journal submission do not provide a definition of research nor clearly articulate which types of research methods are appropriate for publication in the journal. The guidelines do, however, articulate what types of articles are not appropriate for publication in the journal, which includes literature reviews, creative and/or fictional works (UW-Stout JSR, n.d.). Given that the research team identified several instances of content meeting such characterizations, it may be more consistent in terms of "fitness" of the published content with the guidelines for publication, if the journal removes this latter injunction.

As the definition of research in the context of this university becoming an ARI was a needed and helpful guide in the coding and related categorizing of research articles in the current content analysis, this definition may be a helpful one to include within the preface of the journal or in the submission guidelines. Additionally, findings from the mixed-data survey study of the university community as a whole reveal that the majority of participants ($n = 907$, 91%) agreed that this definition of research conceptually aligned

with their own definition in the context of the university as an ARI (Blumer et al., 2014a).

Increasing Attention to Ethics

Although attention to ethics has been variable over time, it is encouraging that over the lifespan on the journal, particularly in the last several issues, there is an encouraging trend as such attention appears to be growing. For example, in the second volume of the journal in 2003 only 20% ($n = 2$) of the 10 articles attended to ethics, and by the relative midpoint, or the seventh volume in 2008, over half, 57.14% ($n = 8$), of the 14 articles attended to ethics. In the twelfth, or what was the most recent volume of the journal in this analysis, from 2013, 38.5% ($n = 5$) of the 13 total articles attended to ethics. In analyzing the patterns around attention to ethics more closely, the team noted that the attention has held relatively consistent since 2007, with each of the volumes not dipping below 1/3 of the articles attending to ethics per volume since this year (6 of 13 or 46.15% in 2009, 7 of 16 or 43.75% in 2010, 12 of 19 or 63.15% in 2011, 5 of 13 or 38.5% in 2012). In considering this pattern in the context of the larger university setting, it may be the case that the students and faculty advisors engaging in research have paid greater attention to ethics as the university has done so, particularly since the inception of the Center for Applied Ethics in 2008 (UW-Stout Center for Applied Ethics, n.d.).

One way to support the trend around the increasing attention to ethics may be for the JSR to require, and provide examples of the way such attention can be included in submissions. For instance, at present the journal does include in its minimum requirements that submissions be "free of plagiarism and original in wording" (UW-Stout JSR, n.d.). Such an explicit focus on research integrity is reflective of findings from the mixed-data survey study of the larger university community in which participants were able to clearly articulate a qualitative understanding of the definition of research integrity (Blumer, Buchanan, & Klucarich, 2014b). Authors are also encouraged to continue the trend of being explicit in their scholarly work, particularly with regard to attending to ethics. One nominal way authors can do this is by noting obtainment of IRB approval in their writing.

Limitations and Future Directions

One of the common limitations associated with conducting a content analysis of scholarly journals is that the researchers often do not have access to rejected manuscripts submitted for publication, and because of this, it is difficult to determine the degree of bias in the submission and acceptance process (Blumer et al., 2012; Blumer et al., 2014). This was also the

case in the current content analysis. In addition, there were limitations with regard to the nature of the research process itself. Conducting research and writing collaboratively comes with both benefits and drawbacks. Collaborative writing teams composed of graduate students have noted the following benefits: pragmatism and efficiency in the collaborative process, camaraderie through collaboration, richness and variation in having different perspectives on the collaborative task, and a lessened opportunity for important details to be missed because there are multiple people involved in the reviewing of the co-constructed product (Blumer, 2010). In the current collaborative study, the team experienced each of these benefits with the exception of the last one. In earlier rounds of the analysis, certain details were overlooked. This was most likely because of the way in which the content of the analysis was divided amongst a rather large research team. Through the revisioning process, however, a more detailed analysis occurred, and the article count updated accordingly.

Despite these limitations, this analysis serves as a seminal study in the understanding of this student-based journal, and potentially in enhancing understanding of like journals across the campuses of the UW-System, as well as those from other ARIs or polytechnic universities across the United States. In order to determine how representative and applicable the current findings are to other state or nationally-based student university journals, future researchers could conduct similar analyses of like journals using the coded categories in the current study as a template. Finally, future researchers could conduct content analyses of the JSR using the same categorical coding process in order to examine both continuity and discontinuity in disseminated research patterns and practices.

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BIOMORPHIC RELAITY

Erin Carr

Senior, BFA in Studio Art Concentration in ceramics and BS in Art Education

Beauty is the ability to create positivity within negativity. It is being content and finding good within devastation. Beauty is discovering encouragement inside the darkest, dirtiest, and most destructive fragments of life. Unforeseen beauty within cancer cells, bacteria, and mental diseases inspires my work and the delicate repetition of forms that exists within it. Conceptually altering dangerous cells that are perceived as negative because of their power, and physically creating beauty from them allows one to experience beauty despite an initial destructive implication.

Dark and destructive components of life continue to extend beyond cells and into the realm of mental health disorders, depression in particular. Repetition within the forms not only revolves around beauty that lies deep within a destructive bacteria, but also allows the viewer to meditate and relax upon viewing the piece. This initial attraction pulls viewers into the piece, allowing them to experience a mental break from the rest of the world and solely reflect on themselves as they interact with the piece. Here, beauty exists in the contentment attained when one enters into a relationship with the work.

Through my personal response to physically destructive cells (cancer) and mentally destructive diseases (depression), I am able to create a sense of balance in my own insecurities and disappointments with society's negative reaction to germs and bacteria. Oftentimes, destructive cells are beyond "ugly" when examining their power, but under a microscope, these same cells are incredibly beautiful. For example, *Malignant* explores the power of cancer cells as they take over a form. The slightly altered spherical shape mimics the morphing and replication of cells as they take over an organ, multiplying and mutating, causing immense destruction. Although incredibly destructive, cells in microscopic imagery possess a very unique, delicate beauty. *Malignant* exemplifies the beauty that can exist within some of the most destructive elements of human life.

The motivation for my work stems from my desire to create serenity and beauty within the repetition, balance, rhythm, and attention to detail in my structures. By mentally manipulating cellular form to challenge its destructive qualities and defying the notion that germs, bacteria, and cells are completely negative, beauty covers the surface of an initially plain, simple form. Beauty can exist in the darkest and most destructive diseases; it just requires deep investigation to discover. However, if one is willing to commit to uncovering beauty, the splendor is far greater than the destruction.

<http://erincarrportfolio.weebly.com>



Epidermis, earthenware, 26x18x18 inches, 2014.



Detail of *Epidermis*, earthenware, 26x18x18 inches, 2014.



Malignant, porcelain, 6x6x6 inches, 2014.



Mitosis, porcelain, 10x4x4 inches, 2014.

NORTHERN EXPOSURES

Jordan Clark

Senior, BFA Studio Art, Painting Concentration

This body of work draws from real spaces, nature, and the process of applying paint. This leads to me to consider spaces outside and inside, natural phenomena, time, and movement.

Painters who interpret real-life observations through abstraction, as well as traditional approaches, influence my work the most. The painters I look to in terms of quality and range of work are Henri Matisse, Richard Diebenkorn, and more recently Leon Benn.

The compositions of my paintings usually consist of a foreground, middle, and background. The application of paint ranges from atmospheric backgrounds using lighter washes, layering, along with sanding and scraping. There is also a speed in brushstrokes, hazy atmospheres, and active beings or occurrences that run along with the illusion of spaces, interiors and exteriors. Structures are developed through layering, overlapping and mixing paint through brushstrokes.

At this point in my painting process, everything is an option concerning how these paintings are made. I am experimenting with different approaches and concepts, including sculptural and printmaking techniques. I am also beginning to challenge myself to look to materials other than paint and to represent gestures that can push a painting to a different place. The use of these new materials and systems can allow my work to expand into a different realm, and at the same time gives me more space to take risks and open the doors to explore and discover.

One of the goals of my work is to consider spaces and movements through life and observation. Part of this translation is taking these real life experiences and interpreting them into abstract paintings. Rather than to simply replicate these moments, my aim is to create familiar spaces with less-representational execution.

The forms I look to range from more organic tree lines, fields, and dense skies, in contrast to more industrial forms like warehouses, train cars, and barns. These structures are ever-present in my life and seem to be overlooked by most, but hold an importance to the history of our Midwest region. These elements are brought to life through paint, represented by simple brushstrokes, washes, and larger scraping gestures.

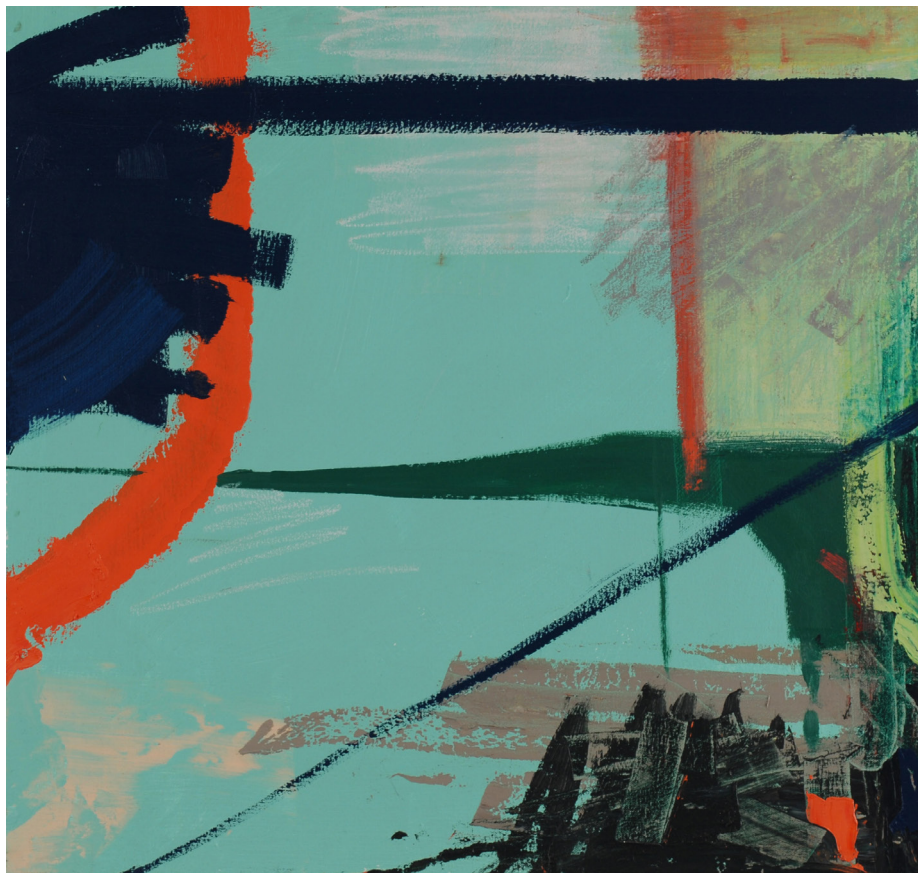
Using saturated colors lends itself to having more of a startling visual impact, and also plays on the ideas of cheeriness and optimism, which pushes against the idea of these dying places and structures that I see every-

where in Wisconsin.

I also use saturation as an extremity to work with or against. Rather than working from a neutral ground, using these heightened colors allows me to make drastic decisions to work with or against the saturation. This leads to discovering new color systems and forces the paintings into a tonal range I would otherwise overlook or underestimate.

The act of painting takes on unpredictable outcomes, forces, and mechanics that in many ways mimic nature and everyday life. Using this understanding helps me to see a balance or divide of both life and paint, which in turn keeps me curious and enthusiastic about both aspects of living and responding/reacting to what I see and feel.

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Long Drive/Short Walk, 20 x 19 inches, oil on
canvas, 2014



Something Other Than, 20 x 18.5 inches, oil on
canvas



Exterior in Green, 6 x 4 feet, oil on canvas



Backseat Love in Pink, 19 x 18 inches, oil on linen,
2014

UNFIXING AGENCY

Rachel Niebur

Senior, BFA Studio Art: Drawing Concentration

I like to conceptually tinker. When concepts surround me, I often muddle through putting them together and trying to form something. To me, whether things are related or not doesn't always seem relevant. The connection between unrelated or related things often creates a path to create something not formerly conceived. In this way, the attempt to connect unrelated or related things can be meaningful.

In relationship to this, I have been tinkering with the idea of conceptual bricolage and drawing. Bricolage is closely connected with postmodernism and its interest in playing with nonsense. While often this requires physical assemblage of objects, the conceptual collection of available materials seems especially applicable in this time, which information is becoming more available and abundant. This abundance of information and noise is hard to employ effectively.

In my work, I strive to combine conceptual bricolage and drawing by using different and sometimes unrelated ideas and systems that I possess to create drawings. This often requires calling upon physical objects and subjects that surround me for information. In addition, each drawing must involve some conceptual element relating to the one that preceded it. This requires me to examine what I know, and additionally what I would like to know in relationship to the drawings I make. Ultimately, this system of conceptual tinkering provides the agency for me to make a drawing. As a result of this process, my drawings can be seen as a series of investigations that lead to one another and that can be viewed in chronological order.

Often the compositions employ layers of information that are results of this process of putting things together. While the subject matter is abstracted, figurative and architectural forms are sometimes evident in relationship to the concepts being transposed, melded, or merged. The bricolage of concepts in these pieces is also parodied in arbitrary drawn connections between abstracted sections and forms made in the pieces. These arbitrary connections, along with the layering of conceptual investigation, result in dense or dispersed conceptual explorations, and atmospheric networks of arbitrary connections.

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"9 hours Gothic", Acrylic gesso, cante,
charcoal, graphite, 3.5 ft x 6 ft, 2014



"Light Lines in TRA", Acrylic gesso, pastel, washes,
3.5 ft x 6 ft. 2014



"Their Air", Acrylic Gesso, pastel, cante., 3.5 ft x 5.5
ft, 2014



"Sliding on Ice", Acrylic Gesso, pastel, cante,
washes, 5.5 ft by 3.5 ft, 2014

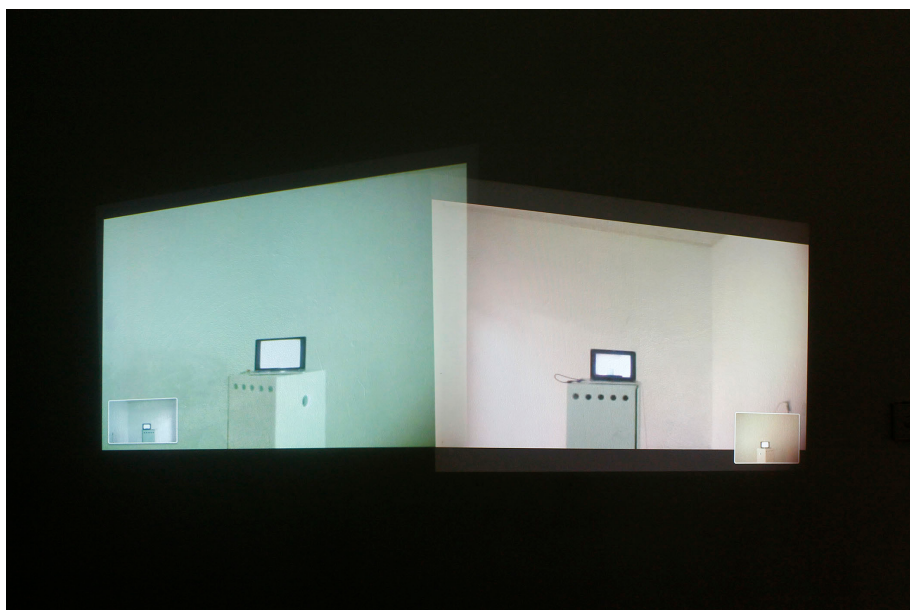
ACQUIRED NARCISSISM**Darcy Mae Petersen**

Senior, BFA Studio Art: Sculpture Concentration

My work necessitates experience—the interactivity of the viewer and the piece. One must get physically involved in order to understand. If there is no engagement, if the trigger is not set off, one has no way of accessing content. Mental participation is no exception. Although the visual aesthetic may be enough for some, it does not come without a conceptual core. The viewer's willingness to become part of the environment is essential to uncover deeper meaning.

I believe technology captures one's immediate attention. Screens are attractive. Movement entertains the eyes. Change stimulates excitement and curiosity. Enticing the viewer entails a presentation comprising computers, projectors, phones, video, and audio. I relay moving images in real-time applications such as FaceTime, and create coded elements with programming platforms, like the Arduino. People have become so accustomed to the immediacy of technology that they are unsatisfied with anything less. After initial attraction, another element must hold the viewer's attention. Interest is maintained when they are included in exclusive conversations.

The visible work acts as a point of departure for the concept of each piece. Analyzing people and how they act/react/interact within the environment of my creation forces viewers to become hyper-aware of themselves, in the same way that I am of them and of myself. I implement what others have called an "Aha! Moment," a reward. People experience it, want more, and expect nothing less. The viewer's ego trumps all. People insert themselves into everything: music, conversation, and so forth; art is no exception. As they wish, I make everything about them. One may try to avoid physical immersion into the piece (staying away from cameras so as not to appear in a screen), but I analyze everyone. My pieces become psychological experiments, I notice the tendencies and habits people may prefer to dismiss. How they move (or don't), how they interact (or don't), how they speak (or don't), how they give criticism (or don't). People feel uncomfortable, paranoid, or uneasy as they begin to realize that they are the subject of discussion. One must admit that these sparks of arousal generate the work we acknowledge, the work we stay with.



profile, two laptops, two projectors, FaceTime, dimensions variable, 2014

Two laptops face one another in the middle of the room, connected via FaceTime. The viewer's profiles are projected live directly in front of him or her when he or she steps in between the screens. This provides the unique opportunity to see oneself from a new perspective. Image taken in Gallery 121.

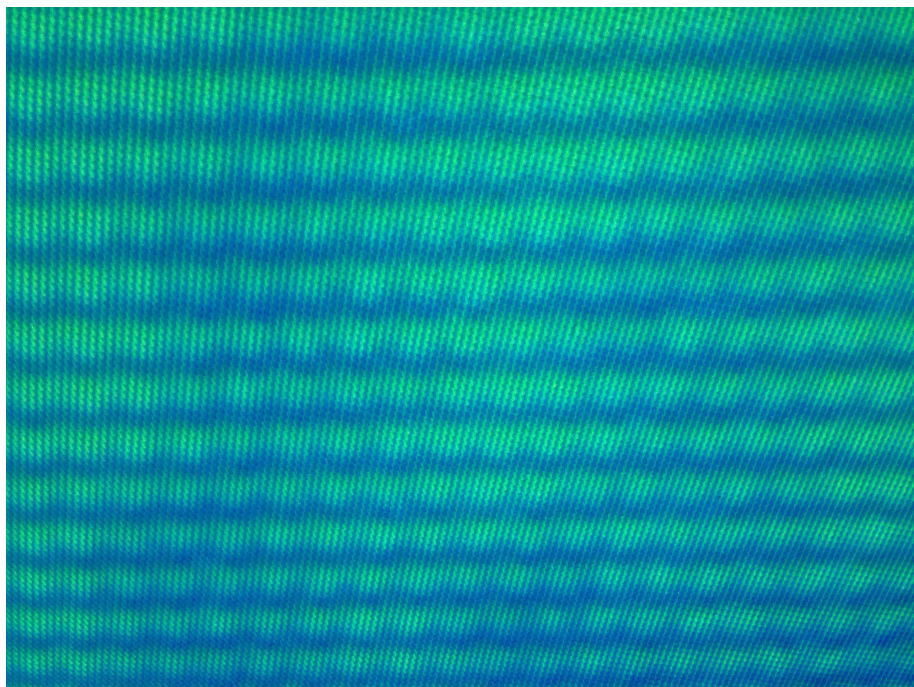


profile (installation view), two laptops, two projectors, FaceTime,
dimensions variable, 2014



or is it, projector, digital image, dimensions variable, 2014

A silhouette of the site-specific space is digitally traced using a projector and computer application. The outlines are left projected onto the composition, nearly undetectable. It speaks to the viewer's individual attentiveness.



px, digital image, projector, dimensions variable, 2014.

The projected image is the layering of a blank projection's pixels. The first picture is projected, and another photograph is taken. This process repeats itself, resulting in waves of green and blue. By creating something from "nothing," *px* deals with changing one's outlook through simple repetition.

*Awarded Best in Show in the Year End Student Show 2014

